Animal Waste Management

ERME II

Volume 4

Tulare County, California

TUCYPL-73-109

ANIMAL WASTE MANAGEMENT

ERME II
VOLUME 4

County planning Tulare co.
Agriculture " "
City planning Nuisance abatement

An Element of the Tulare County General Plan

Prepared by Tulare County Planning Department

County of Tulare

PLANNING DEPARTMENT
Telephone (209) 732-5511 - Ext. 341
Room 107, Courthouse
VISALIA, CALIFORNIA 93277

Honorable Board of Supervisors
Courthouse
Visalia, CA 93277

Gentlemen:

This Animal Waste Element of the General Plan constitutes Volume I of ERME II. The work was funded by a grant from the California Council on Intergovernmental Relations during the 1973-74 Budget year. It is one of three recent practical applications of environmental material to decision making tools in Tulare County; a set of volumes including the Soils Element and the Biological Element.

A critical need to provide specific information about Animal Waste issues and potential solutions has motivated the preparation of this General Plan Element. Special Use Permits for animal raising operations have been required by the zoning ordinance in this County for a number of years. Each hearing on these Use Permits became a custom job requiring special studies and time consuming efforts on the part of the staff and decision makers. The need to develop a plan element specifically related to the resource-related issues of animal industry in the County was apparent. The questions which you and members of the Planning Commission have asked during public hearings prompted the staff to find information to help answer these questions and to give the Board members and Planning Commissioners a better informed basis for decision making.

This Plan Element, therefore, discusses some past problems and points out the probabilities of future problems from animal operations within the County if some moderate care and organization is not applied to the siting, development and operation of these facilities.

During the compilation of information and the analysis of it, public meetings with the Agricultural Advisory Committee and the Environmental Resources Committee were held. During the later meetings many dairy people attended the sessions. Hearings were also held by the Planning Commission and the staff in order to establish certain standards for conditions adopted with Special Use Permits for dairies and feedlots. Those standards, developed with the guidance of the Dairy and Feedlot Industry itself have been incorporated into the policies recommended in this General Plan Element. The Element is therefore based upon the best available information from many technical sources and upon the direct input of local people engaged in these industries.

This Element, in the study section, is not designed to be a condemnation of animal raising operations, but rather to indicate areas where problems have arisen and where they could arise in the future. It is specifically designed to set forth some reasoned policy guidelines to protect both the operators of these animal raising facilities and neighboring property owners, as well as the County as a whole.

It has been our direct objective to bring to you a condensed version of available, technical information about animal waste as a potential problem related to the animal raising industries and to set forth some reasonable policies for your adoption to guide your department staffs in their day-to-day administrative operations.

Thank you for the time you have taken to read this document and the careful deliberations you have made in determining the best set of policies to set forth in this Animal Waste Element.

Sincerely,

TULARE COUNTY PLANNING DEPARTMENT

Robt L. Wall

Robert L. Wall, Planning Director

RLW:ew

This document was prepared with technical assistance from the Council on Intergovernmental Relations utilizing a Comprehensive Planning Assistance Grant from the U.S. Department of Housing and Urban Development under the provisions of Sec. 701 of the Housing Act of 1959 as amended. (CPA/1020.19)

TUCYPL 73-109

Some of the staff worked specifically on this report; however, all of the staff contributed either directly or indirectly to the preparation of it.

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16. Abstracts

Deals with the environmental and social problems caused by the mass production of animals and poultry; primarily with the waste products from such industries. Part I outlines problems connected with wastes and defines physical parameters; Part II, technology for treatment of wastes; Part III, recommends solutions to the pollution problems and use conflicts inherent in accumulation of animal wastes; Part IV, suggests appropriate locations for such projects and policies for problem control; Appendix with California State and local regulations, Soil Conservation Service standards, environmental impact report on dairies; extensive bibliography; geologic, hydrologic, soil, air current, climatic maps included.

17. Key Words and Document Analysis. 17a. Descriptors

Environment	Sewage Treatment	Inorganic Salts
Regulation	Sewage Disposal	Soil Types
Regional Planning	Aerobic processes	Soil Mechanics
Ordinances	Anaerobic processes	Soil Percolation
Standards	Effluents	Ground Water
Animal Waste Disposal	Lagoons	Precipitation
Bovines	Odor Control	Climate
Chickens	Vector Control	Wind
Sheep	Pollution	Evaporation
Horses	Nitrates	Evapotranspiration
Swine	Salinity	Rural Environment
		Urban Environment
		Temperature

17b. Identifiers/Open-Ended Terms

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TABLE OF CONTENTS

LIST OF TABLES & DIAGRAMS

MAPS

Page

Introduction

INTRODUCTION

NEED FOR THE STUDY:

Agricultural production is of great importance to the economy and well-being of the people of Tulare County. An increasingly significant section of local agricultural industry is devoted to raising livestock and poultry, and production of milk. However, livestock, poultry and other animals produce wastes which may, when improperly stored, transported or disposed of, affect the environment of neighbors, Tulare County and the State of California. Where such wastes could add to air, water or land pollution, or contribute to the decreased utility of adjacent, separately owned property, policies must be set for the control and mitigation of harmful and deleterious effects.

AUTHORIZATION:

This document was developed as an extension of a program authorized by the California State Legislature, through Senate Resolution 202, in August, 1971. That resolution recognized that it is difficult for a county to establish policies and resolve problems in an area where the State has not undertaken similar work. In addition, it recognized that diverse elements of the General Plan should be coordinated and combined, where possible, in an effort to truly protect the health, safety and welfare of the general public, and their environment. The first year effort, called the Environmental Resources Management Element, Part I, produced a broad based set of policies designed to protect and manage the environment, in the conservation ethic, and for the best public good. The second year, as a continuation of the first year, was designed to study some aspects of the environment in more detail, in particular those which need a more explicit policy development. Part II, then, is composed of a Soils Element, a Biological Resources Element, and an Animal Waste Element. It also includes an Environmental Directory which outlines local, State and Federal responsibilities concerning the environment and guides communication between those agencies with primary and secondary importance in particular aspects, as well as defining sources of environmental data and information. The following element addresses itself to Animal Wastes.

This second part of the Environmental Resources Management Element was prepared with technical assistance from the Council on Intergovernmental Relations, utilizing a Comprehensive Planning Assistance Grant from the U. S. Department of Housing and Urban Development under the provisions of Section 701 of the Housing Act of 1959 as amended. (CPA 1020.19 - Environmental Management.)

OBJECTIVE AND SCOPE OF THE STUDY:

Under the Environmental Management concept,

(a) Policies and programs should be developed which will avoid degradation of the natural environment and offset or reverse that degradation which has occurred;

(b) The intergovernmental complexity and interrelated nature of the environmental planning process should be recognized;

(c) Local government, which has heretofore had only a limited responsibility for protecting the environment as compared with the State and Federal Governments, should assume its share;

(d) Some environmental issues are of such importance that they should be given priority attention for policy and action in the short term - so that opportunities to treat them in the future may not be foreclosed;

(e) Some resource systems require long periods to restore or require ongoing conservation practices in order to avoid continued decline or degradation.

The Environmental Resources Management Element series has been and will continue to be developed as an integral part of the General Plan of the County. Prior to the inception of the ERME series, the Water and Liquid Waste Management Plan and Program of the County, adopted in 1971, established many policies related to the protection of water and land resources as they were affected by municipal and urban uses. Policies in the ERME II continue this beginning effort, as well as substantially broadening the scope and methods of protection to include more rural industries.

Companion documents do not as directly set environmental policy. Through limiting small division of lands to urban centers, the Urban Area Boundaries Element and the Housing Element of the County specify policies which, when implemented, do contribute less directly to environmental protection.

The Animal Waste Element includes four main sections;

Part I, outlining the problems connected with animal wastes and including data and maps indicating physical parameters which must be dealt with in connection with this problem;

Part II discusses the technology now being used, future technology and mitigation factors;

Part III outlines recommendations for solutions to the pollution and use conflicts inherent in accumulation of animal wastes;

Part IV suggests appropriate locations for concentrated animal and poultry uses, as well as policies for their control;

Appendix contains State Regulations dealing with Water Quality Control, local health regulations, Soil Conservation Service recommendations, a model environmental impact report for the introduction of new dairies into the County, and a bibliography.

ACKNOWLEDGEMENTS:

This document has been completed with the cooperation of the United States Environmental Protection Agency, the United States Department of Agriculture Soil Conservation Service, the Agricultural Extension Service of the County of Tulare, the California State Water Quality Control Board, the University of California at Davis, the Agricultural Advisory Committee of Tulare County, the Tulare County Farm Bureau and many other persons whose advice was valuable. The Tulare County Planning Department, directed by Robert L. Wall, provided basic direction of the study, much of the data, information, graphics and final editing and printing, on behalf of the Tulare County Association of Governments. The principal researcher and writer was Gloria S. McGregor.

*This dairy scene shows a **self contained** community, with dairy workers' homes located in the lower right and the milking parlor and barn in the center (the two buildings in front of the larger yarding areas). The silo to the left contains feed, with hay under the long roof above it; the smaller yarding area (lower left) holds calves and young stock being raised for replacement dairy stock. Shaded loafing areas are scattered throughout the pens.*

Scraping operations have been carried out in *the yard to keep it clean and free from odor and dust. (Marks of such scraping can be seen at the outer edges of the yards in this picture.) The work and thinking that went into the construction of a facility so aesthetically pleasing is impressive. The up-to-date dairy operator has no time for past practices which produced smaller amounts of milk per cow, unhealthy conditions, and sometimes blighted the neighborhood.*

Spring,
1974

A fairly typical example of a modern dairy, except that elimination of water collection in yarding areas has not quite been solved. Further sloping of the yard will convey this water into collection ditches at the periphery of the operation, so that a clean and healthy environment will be maintained for the cows. At the left is the large lagoon used to collect liquid wastes and to bacteriologically modify these wastes until they are clean enough to be used to irrigate surrounding crop lands. Such a dairy might house one thousand to three thousand animals (with additional facilities) in today's efficient dairy production systems.

Spring,
1974

Chapter I

Animal Waste Background

CHAPTER I

BACKGROUND

Introduction

The population increase in the nation and in California and the increase in per-capita consumption of meat, as well as the rising costs of labor and land have combined to push upward the number of animals in dairy and feedlot operations, per operation. Efficiency increases have created higher densities of animals. The problems associated with handling wastes from these new animals and greater concentrations have become increasingly important. In Tulare County, for example, during the period from June, 1972, to January, 1973, almost 33,000 animals were brought into the County in either dairy or swine raising operations.* (This does not include feedlots.) Many of these installations were moved from other areas where increasing urbanization has forced land prices up and conflicts between urban and rural land uses have become too numerous and dangerous to tolerate. According to some accepted standards, the wastes produced by those 33,000 animals is equivalent to the waste production of half of the existing human population of the County.

Of the multitude of factors which portend environmental "chaos", perhaps none are as graphic as those reflecting the water quality degradation associated with the runoff from feedlots and the concentrations of wastes from dairies. Runoff "slug" loads from feedlots associated with rainfall carry effluents which are ten to several hundred times as concentrated as raw domestic sewage.[3] The acute water quality impact of these discharges is far from being as severe as direct feedlot discharges, but the chronic effects over several years due to the increased organic, salt, and nutrient inflow burden soon become apparent. Where manure is spread on pastureland, insidious, diffuse concentrations of pollution materials are causing increasing problems with the regulation and maintenance of stream quality standards.

To produce increasing quantities of livestock in a society with a rising cost of labor, mechanization has been utilized. Mechanization of livestock production requires confinement, and also allows the producer to provide certain other types of environmental controls necessary to the care of large numbers of animals. It also requires significantly less land than pasture or range production. Much of the dilemma, currently being faced by confinement livestock operators with regard to water pollution and related environmental problems, is related to the concentration of numbers of animals. Of added concern is the increased "nuisance" sensitivity of our modern population.

*Figures obtained through Use Permits issued in Tulare County Planning Department during this period.

Studies in California demonstrated a large increase in cattle marketings since 1957,[20] and virtually all of that growth was associated with an increasing number of feedlots with 10,000 head or more capacity. The downward trend of number of livestock operations is expected to continue due to the enlargement of existing units and due to the uneconomic operations of less specialized farms unable to adjust their size. Dairies too are increasing in numbers of animals per operation, with the average number usually 800 animals or more per operation in Tulare County.*

Separation of animal feeding operations from feed production areas has caused the disposal of wastes to the land to be less feasible. Indiscriminate utilization of lagoons as a means for collecting, storing and stabilizing runoff has fostered additional problems. For many farm operations, these structures presented a new level of sophistication in animal waste management. Many farmers thought that such structures had solved the problem without realizing that such systems were often failure-prone; they nearly always functioned anaerobically (therefore had odor) because engineering designs were based either on "rule of thumb" population equivalents or empirical hydrologic (storage) relationships, both of which fail to properly account for the nature and level of waste flow inputs. In addition, nutrients and non-degradable organic constituents may actually be further concentrated by storage functions; odor and sludge removal and disposal problems are frequent; accidental overflow or design discharges from these lagoons are severely damaging to stream quality (these intermittent discharges may be likened to the occasion when municipal treatment plants bypass raw wastes during storms).

In a feedlot, thousands of chemical compounds in wastes which come from feeds, animal metabolism, and microbial by-products produced either in the animal or by putrefaction of feedlot surface materials make the problem of waste disposal and treatment quite complicated. A 100,000 head feedlot would produce wastes (in terms of Biological Oxygen Demand, Nitrogen, and salt) equivalent to at least one million people. Even though treatment could remove sufficient BOD (Biological pollution equivalent) so that the water could be released into a stream, as much as 90 percent of the phosphorus and over 50 percent of the nitrogen would remain to chemically pollute the stream. Such impractical systems of waste disposal are being proposed as complete lagooning of all wastes, complete incineration, and allotment of land for the specific purpose of just decomposing wastes.

*Tulare County will probably be the top dairy producing area in the State in the next five to eight years. Since feed represents 60-70% of the cost, one of the key attractions is the availability of grain and roughage for food.

Daily Manure Productions
(Not including wash water or dilution water)

Animal	Weight of animal (lbs)	Cubic feet per day (feces & urine)
Dairy cattle	1200	1.60
Beef cattle	900	1.20
Horses	1000	.90
Swine	150	.15
Sheep	100	.07
Poultry	4	.004

Organic substances, both biodegradable and relatively unbiodegradable are the largest portion of animal manure. These arise mainly from the partially digested feed of the animal.

Chemical Analysis of Manure Samples
Taken From 23 Feedlots[13]

	Range(%)	Average(%)	Lbs. in 10 Tons
Nitrogen	1.16-1.96	1.34	268
Phosphorus	.32- .85	.53	106
Potassium	.75-2.35	1.50	300
Sodium	.29-1.43	.74	148
Calcium	.81-1.75	1.30	260
Magnesium	.32- .65	.50	100
Iron	.09- .55	.21	42
Zinc	.005-.012	.009	1.8
Water	20.9-54.5	34.5	6,900

Other agents present in animal wastes are inorganic substances, volatile substances which can move into the air, and infectious agents which may infect man and/or animals. The organic matter, when it reaches a body of receiving water, serves as a growth media for *aerobic* ("with air") microorganisms which can rapidly use up the available dissolved oxygen in the water. Then the oxygen uptake of the bacteria exceeds the capability of the receiving waters to take up more oxygen from the air, and the oxygen depletion disrupts the ecology of plant and animal life. Supplementary oxygen, "aerobic treatment", pumped into the water under pressure can offset this imbalance and continue to maintain aerobic disintegration of wastes. However, if the oxygen depletion is allowed to become complete, the body of water then supports a different type of microorganism called *anaerobic* ("without air") bacteria, and the results of the degradation of the organic wastes are volatile gases and organic vapors which are quite odorous and septic.

An alternative situation which may result from poor management of animal wastes occurs when the nutrients such as nitrogen, phosphorus and potassium are allowed to concentrate in the soil and seep down into the underground water supply or into surface water courses. Runoff water which contains relatively low amounts of solids, but nutrients such as nitrogen and phosphorus in unacceptable quantities, may appear clear. The only way to detect such nutrients is by chemical tests.

Dilution with more water will tend to lower the concentrations of the nutrients, but does not diminish the total amount of material in the runoff.

The term "manure" may mean any of a number of things: fresh excrement, including both solid and liquid portions; total excrement, but with enough bedding added to absorb the liquid portion; the remaining part of the total excrement after most of the liquid has drained away; the remaining portion after liquid drainage, evaporation of water and leaching of soluble nutrients; only the liquid which has been allowed to drain from the total excrement. The water content of each of the preceding materials is highly variable. The moisture content of fresh excrement also changes with the type of feed and environmental temperature. There are differences in wastes from single-stomached animals such as swine, where foods are almost completely digested, and herbivores and ruminants such as cattle and horses, where there is a great deal of undigested material in the wastes (more than 25% of the organic matter in cow manure is humus).

It is important not to assume that data accumulated with one species of animal will be applicable to other species. Growing animals, and those producing milk, retain more nitrogen, phosphorous, calcium and digestible components of their food for weight gained, and for milk production, than is retained by mature stock.

The quantity of solid waste derived from cattle being fed an all-concentrate ration is less than half as great as the quantity derived from cattle being fed a 12 percent roughage ration. Simply from the waste abatement and control standpoint, it would be desirable to reduce the quantity of nondigestible material in the feed. This would depend upon the cost and availability of feed; the cost of waste abatement and treatment may place greater emphasis on rations with less roughage and nondigestible material and alter the present concept of least cost rations.

Most dry animal manures have about four percent soluble salt. The amount is variable because of variations in diet, salt content of drinking water and the nature of the animal. In some extreme cases the salt content is as high as 15 percent. Other important chemical constituents of ten tons of cattle manure include 350 lbs. of ammonium sulphate, 120 lbs. of superphosphate, 100 lbs. muriate of potash, 68 lbs. anhydrous magnesium sulphate, 3.64 lbs. manganese, 0.47 lbs. boron, 0.40 lbs. copper, 0.03 lbs. cobalt and 0.05 lbs. molybdenum.[28]

Fertilizer value of hog manure is about 7% Nitrogen, .4% Phosphoric acid, and .4% potash. (Ten tons would contain about 140 pounds of nitrogen, 80 pounds of phosphoric acid and about 80 pounds of potash.) Obviously the chemical constituents vary widely, in different animals, pointing up the fact that waste lagoons should be tailored to individual operations and not engineered on a mass-produced basis.

The old-fashioned dairy was often a breeder of odor and flies, diseases for cows and humans, and milk production was relatively low because of inefficiencies in feeding, lack of shade, etc. This type of situation is becoming scarce as production demands and costs of production rise. Public reaction to such operations is becoming more outspoken at public hearings related to land use.

Spring, 1974

Some older dairies still have old-fashioned drainage problems. Proper sloping of corrals, collection ditches and lagoons would prevent this unslightly, unhealthy situation from occurring. Most modern dairies use great care in design to avoid these kinds of problems, which may be more expensive to remedy than it would have been to initially plan for them in installation of the facility. Such conditions create a need for more cost and use of water for animal cleansing, prior to milking.

Spring,
1974

12. All exterior lighting shall be so adjusted as to deflect direct rays away from public roadways and adjacent property.

13. The proposed facilities shall be constructed, maintained and operated in accordance with all State and County Health regulations, and County zoning and building laws.

14. Any structure built shall conform to the building regulations and the building line setbacks of the Ordinance Code of Tulare County insofar as said regulations and setbacks are applicable to such structure.

15. The conditions set down shall be complied with commensurately or before the premises shall be used for the purposes applied for, in order that the safety and general welfare of the persons using said premises, and the traveling public, shall be protected.

16. The Use Permit shall automatically become null and void one year after the date on which it is granted, unless the applicant, or his successor, has actually commenced the use authorized by the permit within said one-year period. The permit may be renewed.

17. The Use Permit will not be effective until the applicant, at his own expense, has executed and filed with the County Recorder on a certified copy of this permit with a duly authorized acceptance, in a form approved by the County Counsel, endorsed thereon.

ENVIRONMENTAL IMPACT:

As with the Description of Project and the Description of the Environmental Setting, individualized statements will be added in this section when there are unique circumstances for this type of operation and the locale.

ADVERSE ENVIRONMENTAL AFFECTS WHICH CANNOT BE AVOIDED IF THE PROPOSAL IS IMPLEMENTED:

Downwind odors and occasional dust could be a problem that cannot be avoided in the operation of dairies such as these without the use of prohibitively expensive systems. The relatively remote location of these facilities, and certain criteria for spacing and locational factors applied by the Planning Commission and Board of Supervisors in their normal proceedings for the issuance of a Special Use Permit, should reduce the problem of dust and odor to acceptable levels at the site of these projects.

Potential problems of nitrate and salt level increase in local groundwaters is not yet fully substantiated. Specific wastewater treatment facilities including careful collection of wastewaters and materials from the dairy and the anaerobic/aerobic activities of carefully designed wastewater treatment ponds combined with specific agricultural practices including selective cropping, should reduce this potential problem to a manageable level.

MITIGATION MEASURES PROPOSED TO MINIMIZE THE IMPACT:

Precise engineered plans will be filed with the Planning Department indicating that a wastewater collection and treatment system acceptable to the United States Soil Conservation Service for purposes of Federal assistance to such operations will be incorporated here. Wastes and wastewater from all areas of animal concentration are conveyed to one or more sumps. These sumps contain levels of anaerobic

OFFICE MEMORANDUM | TULARE COUNTY DEPARTMENT OF PUBLIC HEALTH

TO Robert L. Wall, Planning Director | DATE: May 10, 1973

FROM A. R. Maniscalco, R.S.

SUBJECT Proposed Criteria for Approval of Dairy Permits in Tulare County, April 18, 1973 Draft (Corrected Copy)

I have had the opportunity to review the April 18, 1973 draft of the criteria and find that items that have been eliminated should be put back in:

1. "The dairy waste pond shall be restricted in depth to maintain at least a 10' separation between the bottom of the pond and any water bearing strata. The dairy waste pond shall not be more than 20' deep."

The Health Department feels that any lesser distance as recommended by studies in Northern California to be inconclusive. The studies had shown that it took approximately 3 months for a pond to seal. Where was the effluent going in that interim period? What was happening to the water bearing stratas? A reasonable margin of safety should be considered and 10' is not too large a margin.

2. "The proposed sump pits shall be large enough to hold 120 days accumulation of waste water."

There are two reasons to include this requirement to make sure that the ponds are large enough:

a. During the winter there is a period of time when the land is wet and no irrigation and no pre-irrigation is taking place.

b. The Water Quality Control Board guidelines require that the pond be large enough to retain run-off from a 10 year, 24 hour storm.

3. "The applicant shall demonstrate that liquid and solid waste materials will be handled in such a manner as to prevent a nuisance caused by any fly breeding, dust or odors. Dust, odor and flies shall be kept to a minimum and shall not be allowed to become a nuisance to the adjoining properties."

This item is clear that the dairyman should not produce a public nuisance.

4. "No portion of the property covered by this application shall be sold or used for purposes other than those expressly permitted under this use permit unless an amendment to the use permit is approved by the County. This shall not restrict the role of the entire parcel of property as a unit."

As evidenced in recent Planning Commission hearings, there can be conflicting agricultural uses. This section protects the neighboring agricultural activities within a given area.

ARM:dmp

Composition of Livestock and Poultry Wastes
(Daily production in lbs. per day)[18]

Animal (weight)	Manure	BOD*	Volatile Solids	Nitrogen	Phosphorus
1200-1400 Dairy Cattle	100.0	2.0	8.0	0.38	0.10
800-1000 Beef Cattle	75.0	1.5	7.0	0.52	0.15
100 lb. Sheep	4.0	0.25	0.86	0.04	0.012
150 lb. Hog	8.5	0.32	0.60	0.07	0.04
4 lb. Poultry	0.25	0.015	0.042	0.003	0.003
1000 lb. Horse	56.0	1.4	8.0	0.48	0.07

*Biological Oxygen Demand materials.

TABLE 3

Total N input in soils, recycled by crops, excess in the soil and calculated NO_3-N concentration in the water in the saturated zone assuming two denitrification levels.

Cow per disposal acre	Total excreted	Incorporation into soil*	Recycled in crops**	Excess in soil	NO_3-N in unsaturated zone*** 0 percent denitrification	50 percent denitrification
	Lb. per acre per year				ppm N	
1	146	73	60	13	3.8	1.9
2	292	146	120	26	7.7	3.8
3	438	219	155	64	18.9	9.4
4	584	292	190	102	30.2	15.1
5	730	365	215	150	44.4	22.2
6	876	438	230	208	61.6	30.8
7	1022	511	242	269	79.6	39.8
8	1168	584	252	332	98.3	49.2
9	1314	657	260	397	117.5	58.8
10	1460	730	265	465	137.6	68.8
11	1606	805	270	533	157.8	78.9
12	1752	876	275	601	177.9	89.0
13	1898	949	280	669	198.0	99.0
14	2044	1022	285	737	218.2	109.1
15	2190	1095	290	805	238.3	119.2

* Assuming 50 percent of total N volatilized as NH_3.

** Two crops per year.

*** In water in unsaturated zone below root systems assuming the drainage volume is 15 surface inches per year.

QUANTITY OF NITRATE AND OTHER SALTS EXCRETED BY DAIRY COWS AND THE CONTRIBUTION TO GROUNDWATER*

Central Valley

Number of Cows/Acre	Excreted: Nitrogen Reported as Nitrate	Excreted: Total Potential Salts (Excl. Nitrate)	Excreted: Total Potential Salts	Contribution to Groundwater: Nitrate	Contribution to Groundwater: Total Salts (Excl. Nitrate)	Contribution to Groundwater: Total Salts
	lbs./acre/day			lbs./acre/day		
1	1.77	1.56	3.33	0.44	1.12	1.56
2	3.54	3.12	6.66	0.88	2.23	3.11
3	5.31	4.68	9.99	1.32	3.34	4.66
4	7.08	6.24	13.32	1.76	4.43	6.19
5	8.85	7.80	16.65	2.20	5.53	7.73
6	10.62	9.36	19.98	2.64	6.60	9.24
7	12.39	10.92	23.31	3.08	7.68	10.76
8	14.16	12.48	26.64	3.52	8.85	12.27
9	15.93	14.04	29.97	3.96	9.72	13.78
10	17.70	16.60	33.30	4.40	10.90	15.30
11	19.47	17.16	36.63	4.84	11.92	16.76
12	21.24	18.72	39.96	5.28	13.02	18.30
13	23.01	20.28	43.29	5.72	14.08	19.80
14	24.78	21.84	46.62	6.16	15.13	21.29
15	26.55	23.40	49.95	6.60	16.17	22.77

*Data developed under actual field conditions, where soils have good internal drainage. Losses of nitrogen by volatilization and by crop removal were both taken into account. No denitrification loss of nitrogen was assumed.

Data developed by:

Roy L. Branson, Extension Soils and Water Specialist

Robert S. Ayers, Extension Soils and Water Specialist

Jewell Meyer, Area Technologist) University of California

QUANTITY OF NITRATE AND OTHER SALTS EXCRETED BY VARIOUS TYPES OF LIVESTOCK AND THE CONTRIBUTION TO GROUNDWATER*

Central Valley

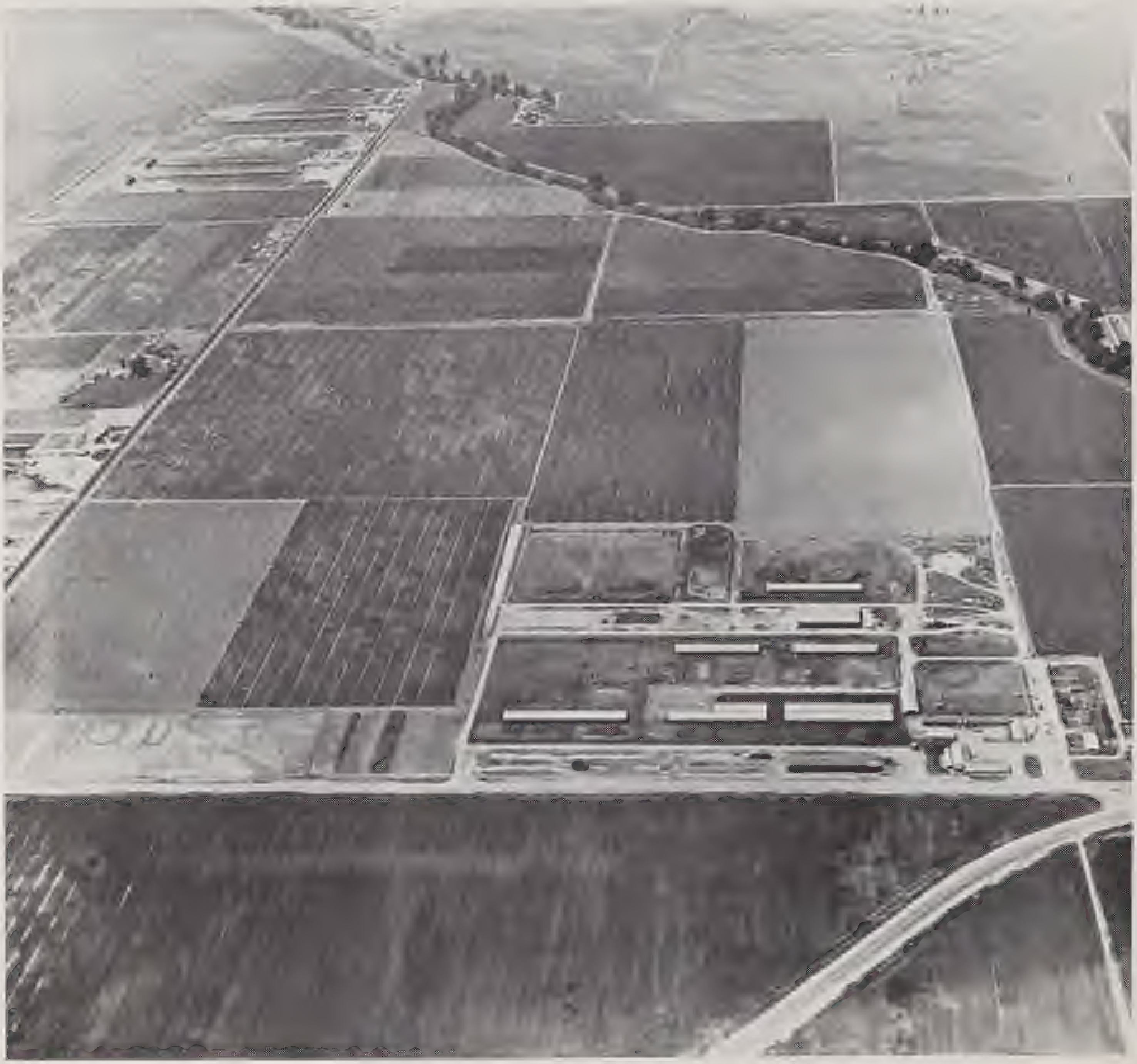
		Excreted			Contribution to Groundwater		
Type of Livestock	No./Acre	Nitrogen Reported as Nitrate	Total Potential Salts (Excl. Nitrate)	Total Potential Salts	Nitrate	Total Salts (Excl. Nitrate)	Total Salts
		- - - - lbs./acre/day - - - -			- - - - lbs./acre/day - - - -		
Beef							
Steer (500-1050#)	1	1.23	0.47	1.70	.30	.34	.64
Calf (249-537#)	1	0.46	0.54	1.00	.11	.36	.47
Poultry							
Broilers	1000	10.42	6.35	15.77	5.20	3.57	8.77
Layers	1000	22.12	14.13	36.25	11.05	2.49	13.54
Turkeys	1000	34.57	18.57	54.14	17.24	10.72	27.96

*Data developed under actual field conditions, where soils have good internal drainage. Losses of nitrogen by volatilization and by crop removal were both taken into account. No denitrification loss of nitrogen was assumed.

Data developed by: Roy L. Branson, Extension Soils and Water Specialist; Robert S. Ayers, Extension Soils and Water Specialist; Jewell Meyer, Area Technologist) University of California

This carefully drained feedlot has almost all feeding areas covered, allowing animals to be fed away from the elements. Exercise areas are properly drained in winter and sprinkled in summer to maintain correct soil moisture to avoid mud or dust. This facility provides a feed efficiency increase of 10 to 15 percent, since animals are not working against muddy surfaces and other hazardous factors. The housing facility may have slotted floors and automated manure scrapers, thus eliminating the need for handwork necessary to keep an open feedlot clean. Automated feeding systems in covered housing facilities further help to reduce labor and feed handling costs. Such modern feedlots provide numerous additional benefits such as odor control and improved animal health, as well as simplified requirements for monitoring and maintaining nutritional quality control. They are less hazardous to adjoining people and land uses. They manage waste materials for maximum reuse.

Feedlot w/Tagus
4/1/74



Without proper collection of waste water in the form of the sewage lagoons, wastes could contaminate nearby stream courses such as Elk Bayou seen here. Three other dairies on the left side of the picture are of the modern type where both feeding and loafing are done under one roof and wastes are collected in storage lagoons for managed recycling.

Nunes Dairy
4/1/74

Effect of Animal Uses On Land:

The often used statement that "wastes are resources out of place" is uniquely applicable to animal wastes. The implication is that the efficient use of resources such as wastes would result from the identification of their productive capacity. In truth, animal wastes in years past were an essential part of the agricultural economy, and it is only since the quantities have become concentrated that such resources have begun to be thought of in terms of "wastes." Pollution from these concentrated "wastes" can be as detrimental to the environment as wastes from any other industry. The nuisance and pollutional characteristics inherent in such facilities have often been minimized in an effort to not face the problems.

There are several rather distinct and different types of pollution and nuisance aspects of animal and poultry concentrations with which planning and regulation agencies must deal. These include air, odor, dust, water (both surface and ground) and soil pollution; and each is of varying degree of importance depending upon the particular operational set-up.

A persistent problem arising from the confinement of large numbers of animals is the air pollution from animal wastes. It is especially prevalent near the feedlots, or where the field spreading of unstabilized wastes is practiced, and becomes particularly obnoxious adjacent to residential or recreational areas. Air pollution from feedlots consists of organic odors, dust and ammonia. Airborne ammonia from cattle feedlots and/or dairies near rivers and lakes may contribute more nitrogen enrichment to these bodies than runoff and deep percolation from the same sources. As much as 90 percent of the urinary nitrogen excreted on a feedyard can be released as ammonia, directly into the air. A dusty feedlot may cause pneumonia in cattle, but may be kept under control by sprinkling with a permanently installed sprinkler system.

Odor control is largely unsolved. The odors from animal wastes are a complex mixture of malodorous gases such as Hydrogen Sulfide (H_2S) and Ammonia (NH_3), and organic compounds such as aliphatic amines, mercaptans, sulfides, organic acids, and skatoles. The odors carry over great distances and often persist for a long time.[9] Odor control chemicals are available, but have limited use due to lack of knowledge concerning their effectiveness and expense. Lime may be used to suppress odors and volatilize nitrogen, but may not be practical where local soils are already high in lime. Until knowledge is greater, cleaning of yards where possible, dust control, and zoning land uses to keep concentrations of people away from the immediate vicinity are the most practical controls. Low density distribution of the wastes, with tillage, to allow soil organisms to dissociate and utilize the constituent material has been the natural, historical, and often presently only means of economic control.

Pollution materials from agricultural lands and from feedlots are not always recognizable by visual inspection. Runoff water containing large amounts of solid material and color are normally detectable by human eye, while runoff water which contains relatively low amounts of solids, but with soluble nutrients such as nitrogen and phosphorus in unacceptable quantities, may appear clear. Therein lies one of the largest potential pollution concerns: nitrogen and salt concentrations resulting from animal wastes. Excessive salts resulting from present and future animal waste concentrations are estimated to increase the TDS (total dissolved solids) concentrations, by the year 2000, by 24 mg/l in the Kaweah River watershed (16% of increase in TDS expected in this watershed), and by 3 mg/l (.5% of TDS expected in this watershed) in the Tule River watershed. *To indicate the nature and extent of the problem, "....nearly 195,000 acres in the region (5D) have had capital invested in either open or tile drain systems. Costs for these systems range from $10.00 to $400.00 per acre. ....Approximately 250,000 acres have an annual application of 8 acre-inches of water for leaching at a cost of $20.00 per acre. Approximately 85,000 acres incorporate two tons of gypsum per acre or some other soil amendment at a cost of $15.00 per acre. The aggregate annual cost (1973 figures) of these activities in excess of $9,600,000 for the Basin... In looking forward, our judgment indicates that nearly 900,000 acres of land in Region 5D will require some form of additional expenditure at a total cost in excess of $200,000,000 to permit continued production (in the next twenty to fifty years)." (Letter August 9, 1973, from William W. Wood, Jr. Economist, Agricultural Extension Service, U. C. Davis, to K. G. Tranbarger, Daniel, Mendenhall and Johnson, contractors to Department of Water Resources, State of California, for Tulare Lake Basin 5D Plan.)*

It is estimated that about 30% of the nitrogen is volatilized to the air, about 10% denitrified, about 40% taken up by plants and about 20 percent is left to leach to groundwater or to be taken up by plant intakes in later years, in the manure which is deposited on the ground. Other studies indicate that from any application of manure to the ground, about 30 percent of the nitrogen is mineralized (the transition from organically combined N to that usable by the plants) the first year, about 10% of the second year (of the residual) about 10% of the residual the third year and 5% the fourth year. (See Graphs 1 and 2.) Because of this gradual increase in yearly mineralization, as the residual organic N in the soil increases, constant rates of application of most organic N sources are not desirable. If a constant rate that will build up to the desired yearly mineralization is being used, it can be supplemented with inorganic sources until the organic source can supply all that is needed. (The inorganic sources will be nearly fully utilized in plant growth in any one year with little residual, if overapplication is avoided.)

The amounts of any given material required per year to maintain given yearly rates of mineralization can be determined. By use of the two tables below, the application rate for any specific year can be determined by ascertaining the ratio for that year (Table 1) and multiplying it times the yearly mineralization rate (Table 2).

In the zone of aeration (from the soil surface to the water table), direction of the water movement is primarily vertical. In general, nitrate movement through the zone of aeration will be slower than the bulk fluid movements because of dispersive and diffusive mechanisms. In the zone of saturation (where all voids in the soil are filled with water) the rate of water movement depends on the hydraulic and transmissive character of the sediments and the hydraulic gradient. (The hydraulic gradient in the Tulare Basin is generally from the east to the west.) In most areas, the groundwaters are, in general, unconfined, and can be in hydraulic contact with the ground surface, allowing nitrate to percolate readily, along with applied waters, through the zone of aeration to the water table. If localized layers of clay and silt are present, however, these will retard the downward movement of waters, and serve as partially confining aquifers. Generally, vertical mixing of nitrate water resulting from the accumulation of percolating nitrated waters in the upper saturated zone is very slow.

RATIOS OF YEARLY MINERALIZATION RATES TO ANNUAL APPLICATION RATES OF ORGANIC WASTES AT CONSTANT ANNUAL INPUTS OF N FOR SIX DECAY SERIES FOR VARIOUS TIMES FOLLOWING THE INITIAL APPLICATION.*

Decay Series	Typical Material**	Time, Years							
		1	2	3	4	5	10	15	20
		Mineralization/application ratio							
0.90, 0.10, 0.05	Chicken manure	0.90	0.91	0.92	0.92	0.92	0.94	0.95	0.96
0.75, 0.15, 0.10, 0.05	Fresh bovine waste, 3.5% N	0.75	0.79	0.81	0.82	0.83	0.87	0.90	0.92
0.40, 0.25, 0.06	Dry corral manure, 2.5% N	0.40	0.55	0.58	0.60	0.63	0.73	0.80	0.85
0.35, 0.15, 0.10, 0.05	Dry corral manure, 1.5% N	0.35	0.45	0.50	0.53	0.55	0.65	0.73	0.79
0.20, 0.10, 0.05	Dry corral manure, 1.0% N	0.20	0.28	0.32	0.35	0.38	0.52	0.63	0.72
0.35, 0.10, 0.05	Liquid sludge 2.5% N	0.35	0.42	0.44	0.47	0.50	0.61	0.70	0.77

*This ratio equals the pounds of mineralized N in any year per pound of N added per year.
**The N content is on a dry weight basis.

Source: California Agriculture, U. of Cal., June 1973; "Using Organic Wastes as Nitrogen Fertilizers," P. Pratt, F. Broadbent, J. Martin.

Under past *management habits and practices, problems of surface, groundwater, and soil pollution, as well as problems of cleansing the animals before milking were constant. This picture illustrates one of the older types of dairies in Tulare County, where waste management practices are poor. In summer this creates odors, flies and disagreeable surroundings for the cows and for human residents of the area, as well as consumption of more water and time in cleansing the animals to ready them for milking. In winter this can translate additionally into even worse pasture and corral conditions for the cows.*

Waste waters are allowed to simply run off in local drainage with no attempt to manage or avert the waste problems.

5/3/74

These animal pens exhibit an accumulation of manure-mud usually found in older operations. Providing a proper moisture balance is maintained, as seen here, neither dust nor excessive mud (with attendant odors) will prevail. Mechanical removal is the usual major cost operation to control waste, and water sprinkling in dry weather combined with limiting numbers of animals on the ground in wetter weather, are the primary mitigating operations.

A feedlot near a homesite may not be regarded as a pleasant or an aesthetic environment.

Land use conflicts, expressed as zoning problems, arise in connection with animal or poultry concentrations almost daily in rural America. Agriculture receives more bad marks on the "pollution scoreboard" for waste problems from animal production than from any other activity. Thus, the separation of residential urban uses from agriculture is increasingly important in order to avoid conflict and to protect both kinds of land uses.

5/16/74

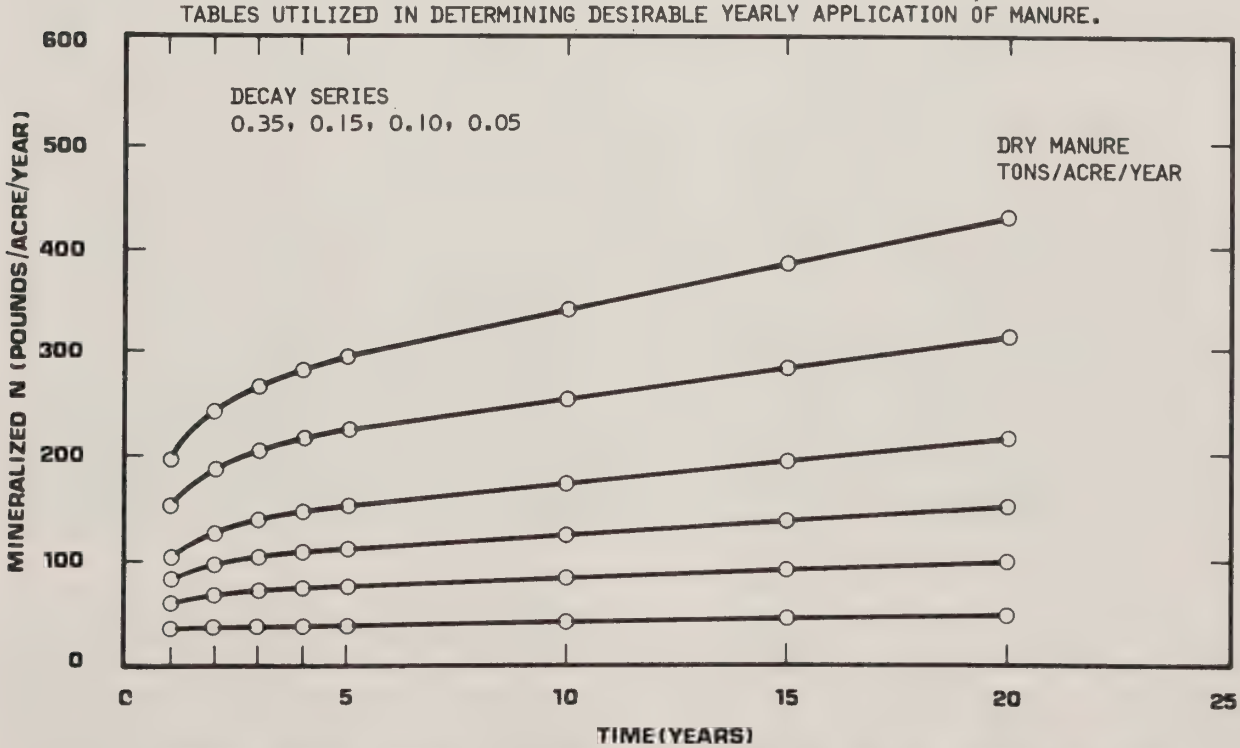
RATIO OF YEARLY N INPUT TO ANNUAL N MINERALIZATION RATE OF ORGANIC WASTES AT CONSTANT YEARLY MINERALIZATION RATE FOR SIX DECAY SERIES FOR VARIOUS TIMES FOLLOWING INITIAL APPLICATION*

Decay Series	Typical Material**	Time, Years							
		1	2	3	4	5	10	15	20
		N input/mineralization ratio							
0.90, 0.10, 0.05	Chicken manure	1.11	1.10	1.09	1.09	1.08	1.06	1.05	1.04
0.75, 0.15, 0.10, 0.05	Fresh bovine waste, 3.5% N	1.33	1.27	1.23	1.22	1.20	1.15	1.11	1.06
0.40, 0.25, 0.06	Dry corral manure, 2.5% N	2.50	1.56	1.74	1.58	1.54	1.29	1.16	1.09
0.35, 0.15, 0.10, 0.05	Dry corral manure, 1.5% N	2.86	2.06	1.83	1.82	1.72	1.40	1.23	1.13
0.20, 0.10, 0.05	Dry corral manure, 1.0% N	5.00	3.00	2.9	2.44	2.17	1.38	1.13	1.04
0.35, 0.10, 0.05	Liquid sludge, 2.5% N	2.86	2.33	2.19	2.03	1.90	1.45	1.22	1.11

*This ratio equals pounds of N input required to maintain a constant annual rate of N mineralization.
**The N content is on a dry weight basis.

Source: California Agriculture, U. of Cal., June 1973; "Using Organic Wastes as Nitrogen Fertilizers," P. Pratt, F. Broadbent, J. Martin.

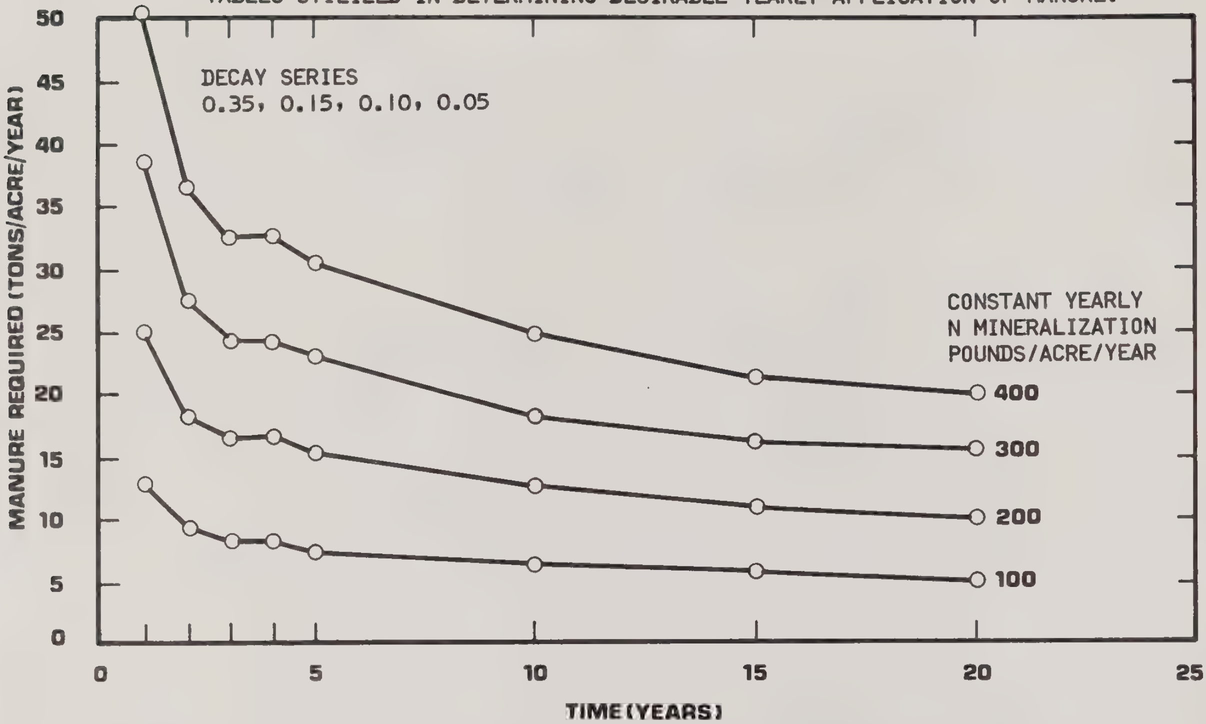
TABLES UTILIZED IN DETERMINING DESIRABLE YEARLY APPLICATION OF MANURE.



YEARLY MINERALIZATION RATE IN RELATION TO TIME FOR VARIOUS CONSTANT RATES OF CORRAL MANURE HAVING 25% WATER AND 1.5% N ON A DRY WEIGHT BASIS.

SOURCE: "CALIFORNIA AGRICULTURE", JUNE, 1973

TABLES UTILIZED IN DETERMINING DESIRABLE YEARLY APPLICATION OF MANURE.



YEARLY RATES OF APPLICATION OF MANURE CONTAINING 25% WATER AND 1.5% N ON A DRY WEIGHT BASIS, REQUIRED TO MAINTAIN VARIOUS CONSTANT YEARLY RATES OF N MINERALIZATION. SOURCE: "CALIFORNIA AGRICULTURE", JUNE, 1973

In general, nitrate concentrations, then, become higher in groundwater located below coarse-textured good agricultural soils (loamy sand, sandy loams) under intensive agricultural use. Soils of fine-textured (clay loam and clay) or soils with subsoils which restrict downward movement of water may offer a useful potential for denitrification and reduction of the pollution of underground water supplies. This is partially because of the presence of increased numbers of nitrogen oriented organisms in such soils as well as the hydraulic structure of the soil.

Manure ponds seal under all soil conditions. The time required for sealing varies with soil texture, however, and "loading." Sandy loams, loams, and clay loam soils seal under a reasonable manure loading rate equal to waste from 100 cows per ten acre-foot pond size in less than thirty days. Loamy sands seal in 30 to 60 days under reasonable conditions. Ponds constructed in high water table conditions (water table at the pond bottom or above), sealed at the same rate as ponds with a deep water table. Nitrate and salt concentrations in soil solutions under ponds were found to be about the same under high water table conditions as under ponds with deep water tables. Under high water table conditions, if the pond water is drawn below the water table level, an apparent upward gradient may occur and seepage may occur for 10 to 20 days following refilling with manured water. Lateral movement from ponds seems not to exist. The maximum downward movement found, after manure sealing, was one millimeter per day under the coarsest soil conditions. The quantities of salt and nitrate moving through the soil profile are low. Total Dissolved Salts (TDS) in the ponds increase linearly with time and are a function of loading. Virtually no salt is lost from the ponds.[20] Therefore, sludges from pond bottoms may contain high concentrations of salts. The disposition of sludge wastes when ponds are cleaned is important in that, if the wastes are spread on agricultural lands, the high concentrations of salt may cause serious damage to soils. Runoff to surface waters and percolation to groundwaters will also be injurious.

Contaminations are slow; it takes from 10 to 50 years for nitrates to be carried from the surface to a water table 100 feet beneath the ground. After several months of use of unlined aerobic waste ponds, levels of nitrate and salt in soil solutions from below the ponds manifest very small changes. Ponds develop a bottom layer of sludge, with a very low nitrate-nitrogen content and a very high BOD value. This mat of high BOD material acts as a nitrate filter, or an energy source for denitrification and removes much of the nitrate prior to the solution entering the soil.

In Colorado, some of the wells in or near feedlots, however, have had to be abandoned because of unsuitability of the water, even for livestock use. Core drillings there have shown that nitrate under cattle feedyards ranged from none to over 5000 pounds of nitrogen per acre, in a 20 foot profile; the average for 47 cores was 1,436 pounds.[3] Under feedlots, nitrates usually decline markedly with depth.

The aerobic lagoon usually is built no more than 15 to 20 feet deep and provides for continual bacteriological action. Properly operated, odor is eliminated, and the decanted, clean water is pumped back to the flushing system with this floating pump.

These lagoons are relatively cheap to construct, and require a minimum of maintenance other than cleaning of the solids build-up at regular intervals.

Roy Sharp Hog Farm
5/16/74

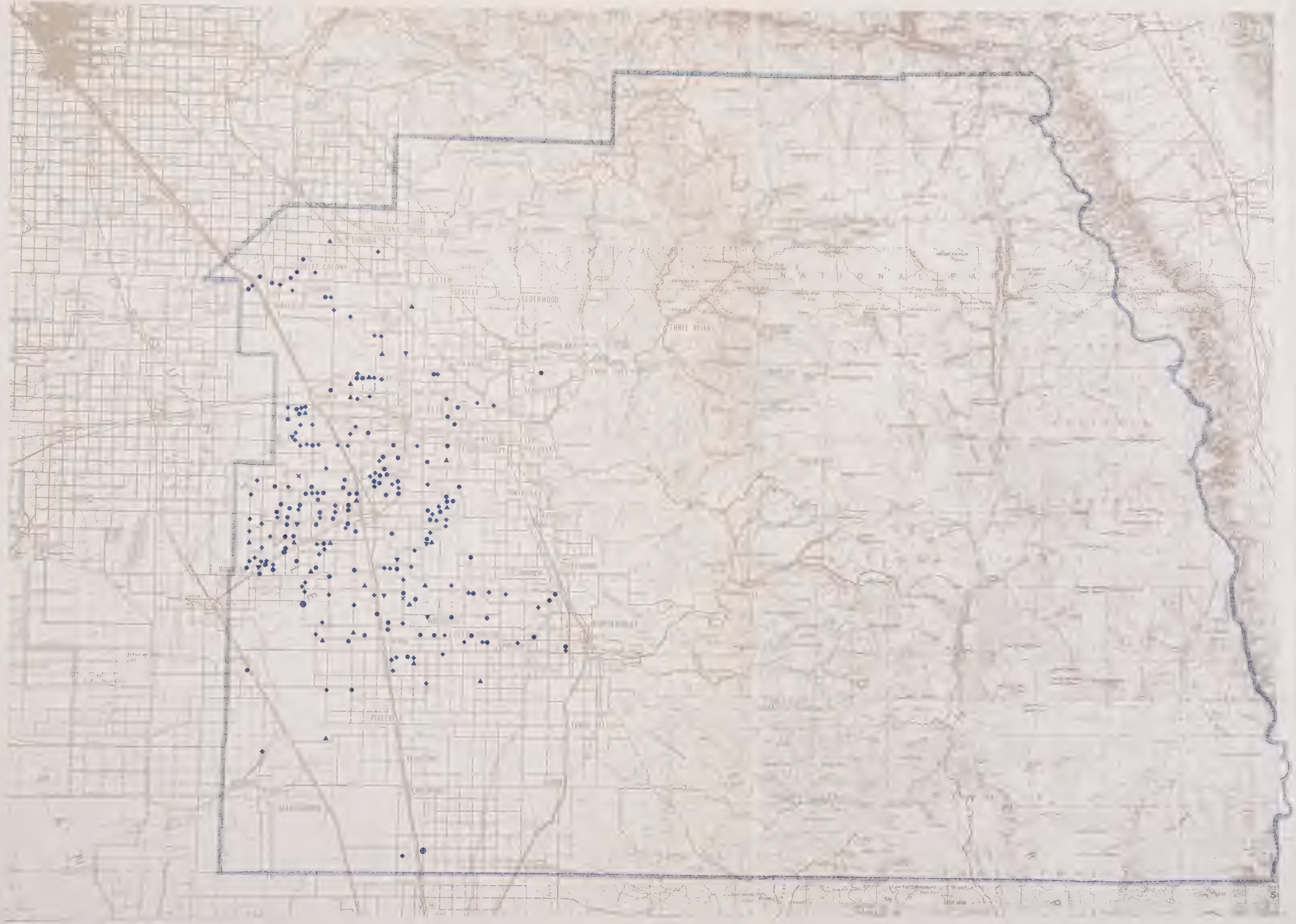
A sewage lagoon that has not been used and maintained properly, allows plant growth, buildup of solids and generally undesirable conditions. Such problems can be avoided through a regular maintenance program, at relatively low cost.

5/3/74

DAIRY LOCATIONS
IN TULARE COUNTY

DAIRY LOCATIONS IN TULARE COUNTY

There were a substantial number of dairies in Tulare County by the spring of 1973. Between June of 1972, and January of 1973, about 30,000 dairy and swine animals were moved into the County from elsewhere, representing, in terms of waste, the equivalent of the entire human population of Tulare County (200,000). The adjacent map shows that most of the dairies are less than 500 head in size; however, these are usually older dairies. The modern dairy farmer finds efficiency with larger numbers of animals. There is now a number of dairies containing over 1,000 animals. The dairy worker now often prefers to live close to urban centers where he and his family have access to services (shopping, churches, schools, and recreation), within a few miles from his work location. This, together with a strong church affiliation of many new dairymen, probably accounts for the large number of dairies clustered around the Visalia-Tulare area. Other factors include availability of suitable land, at a reasonable price and availability of existing dairy-related service and equipment vendors, as well as available milk transport.



DAIRY LOCATION OF UNITS

TULARE COUNTY

LEGEND

CATTLE PER HEAD

- ● 0 - 250
- ◆ 250 - 500
- ▲ 500 - 750
- ▼ 750 - 1,000
- x 1,000 - 1,500
- \+ 1,500 - 2,000
- ⊕ 2,000 +

Source: Tulare County Agricultural Extension Office.

NORTH

2 3 4 5 6 MILES

SCALE

PREPARED BY TULARE COUNTY PLANNING DEPARTMENT

Dry manure application rates of 10 to 20 yards per acre resulted in low nitrogen and soluble salt measurements in the soil solution beneath the root zone. (About the same as when commercial fertilizers were applied at the recommended rates). High manure rates (40 to 50 yards [dry] per acre) produced high nitrate and salt concentrations in the soil solution below the root zone. Clay pan or hardpan, directly beneath the root zone, contained a low concentration of nitrates immediately above these layers, but high concentrations of salts.

Specific areas of concern with relationship to chemical pollution are these:

1. The physical movement by runoff water of animal waste products from the land surface into surface water.

2. The movement, by percolating water, of nitrogen and salt applied in excess of crop needs into drainage water which may later appear in surface water or in a groundwater aquifer.

3. The excessive build-up of soil phosphorus which may cause plant nutrition problems and/or may be moved into surface waters on suspended particles if soil erosion occurs.*

4. The excessive application of salt (sodium chloride) which may affect seed germination and plant growth in the short run and an excessive build-up of sodium in the soil in the long run, adversely affecting the physical conditions of the soil which affects plant growth.

5. The excessive build-up of potassium which could affect plant nutrition and (depending on the crop and ration), animal nutrition. The excessive accumulation of elements, biologically toxic at high concentrations, but derived from food additives, e.g., arsenic, copper, etc.

Manure applied in excess of ten tons per acre provides nitrates which will not be utilized by plants. (The salt content of ten tons of manure is about 800 pounds and consists of about 200 pounds of sodium chloride and 600 pounds of potassium chloride.) The ten ton rate of manure application would raise the percentage of total soluble salts in the surface six inches of soil approximately .04 percent or 400 ppm, until it is leached by the irrigation water. This amount of salt would not be expected to have any detrimental effects on the productivity of soils which are low in total soluble salts to begin with, but when these salts are added to soils that already have a high total soluble salt content, some additional reduction in yield, or limitation on the crop selection will occur. A reduction in germination could occur because salts contained in manure would be near the surface (where the seed is) at least until removed, even though the average in the top six inches of soil was otherwise within tolerance limits.

Nitrate-nitrite poisoning effects have been noted in humans and ruminants, such as cattle, at concentration levels exceeding 2,000 ppm (safe drinking water standards for humans are set at 45 ppm NO_3), but nitrate poisoning results more commonly from the consumption of large amounts of feeds or plants containing high levels of nitrate. Nitrates in water or food are particularly dangerous to babies and growing children. Nitrates in water may be undesirable or harmful for certain industries such as brewing, other fermentation processes, and food product processing.[22] For certain crops (sugar beets, grapes, for example) a continuous supply of N is undesirable because the maturation or ripening process is delayed or otherwise negatively affected.

Excess nitrogen is often limiting to the growth of aquatic plants and animals, such as algae and other plankton, but the amount which is detrimental is difficult to define and is peculiar to each individual body of water. The amount is affected by clarity or turbidity of the water body, the presence or absence of certain essential trace elements, the presence of one or more toxic elements, or low and limiting levels of other normal essential nutrients such as phosphorus or carbon.

The livestock industry with its present technology, apparently cannot exist without some environmental impairment by animal wastes. On the other hand, the animal industry cannot and apparently does not wish to, operate or expand with total disregard of the environment and the people of the County. The concept of a totally unimpaired or a totally polluted environment is not meaningful. Wise judgement and action must be applied by local government and the people in the livestock industry. New technology, much of it arising from the members of the industry itself, may contribute major solutions. Wise locational planning can help to diffuse total waste production to aid natural, age-old processes to effectively continue to convert these "wastes" to useful soil amendments.

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*Tests indicate little or no crop response to phosphorus additions where the phosphorus test levels were up to approximately 100 pounds of P_2O_5 per acre per year.[4]

Economics

Crop production can be maintained on land receiving high rates of animal wastes, but nitrate and salt accumulations make the practice appear unsatisfactory. Nitrates accumulated in soil profiles treated with high rates of manure may pollute groundwater or result in high concentrations of nitrates in crops. Crops grown for silage could contain enough nitrates to be a health hazard for livestock, especially calves. Salt accumulations are also likely on soils treated with excessive animal wastes, especially in areas where little or no leaching occurs. Since manure contains large amounts of potassium and sodium, the soil physical properties may be adversely affected in time.

Pollution hazards of using animal wastes on croplands are eliminated only when the crop uses most of the nitrogen. When excess nitrogen is applied, nitrate either accumulates to excessive levels in the forage, or moves through the soil profile with the leaching water, or both. These nutrients, however, are a valuable resource, and can, when properly managed, be useful for growing plants and useful for conditioning the soil. Manure applications of 30 to 50 wet tons per acre are not excessive on heavily cropped soils. Therefore, the ratio of lands needed for disposal of feedlot or dairy wastes to feedlot or dairy area will be determined ultimately by the permissible accumulation of nitrogen and salts in the soil profile.[18]

There are other alternatives to disposal upon adjacent and integrally owned land of the operator, such as hauling, deep percolation of nitrate and soluble organic nitrogen compounds, volatilization of ammonia and possible other bases, or nitrification to harmless nitrogen gas on the site.

Reducing the roughage content of finishing rations for cattle on feedlots from 12 percent to zero would alone eliminate approximately one-half of the solid waste accumultion on the feedlot surface.[8] Also, consideration should be given to composting solid waste as a normal part of feedlot operations, to reduce the land, air and water pollution potential of the accumulated waste and to reduce the volume of the accumulated waste. Firm commitments, in the form of land leases, with renewal options, or cooperating contracts between feedlot and/or dairy owners should be obtained for all disposal areas needed over and above the contiguous acreage owned outright. A formula for estimating the economic hauling distance for hauling wastes follows:[5]

$$D = \frac{F-L-S+M-M^1}{H}$$

where: D = maximum economic hauling distance in miles

F = value of commercial fertilizer with an equivalent nitrogen, phosphorus, and potassium per one ton of manure in \$/ton

L = loading costs in \$/ton
S = spreading costs in \$/ton
H = hauling costs in \$/ton/mile
M = costs paid farmer by feedlot* owner to accept manure in \$/ton
M^1= price paid feedlot* owner by farmer for manure in \$/ton

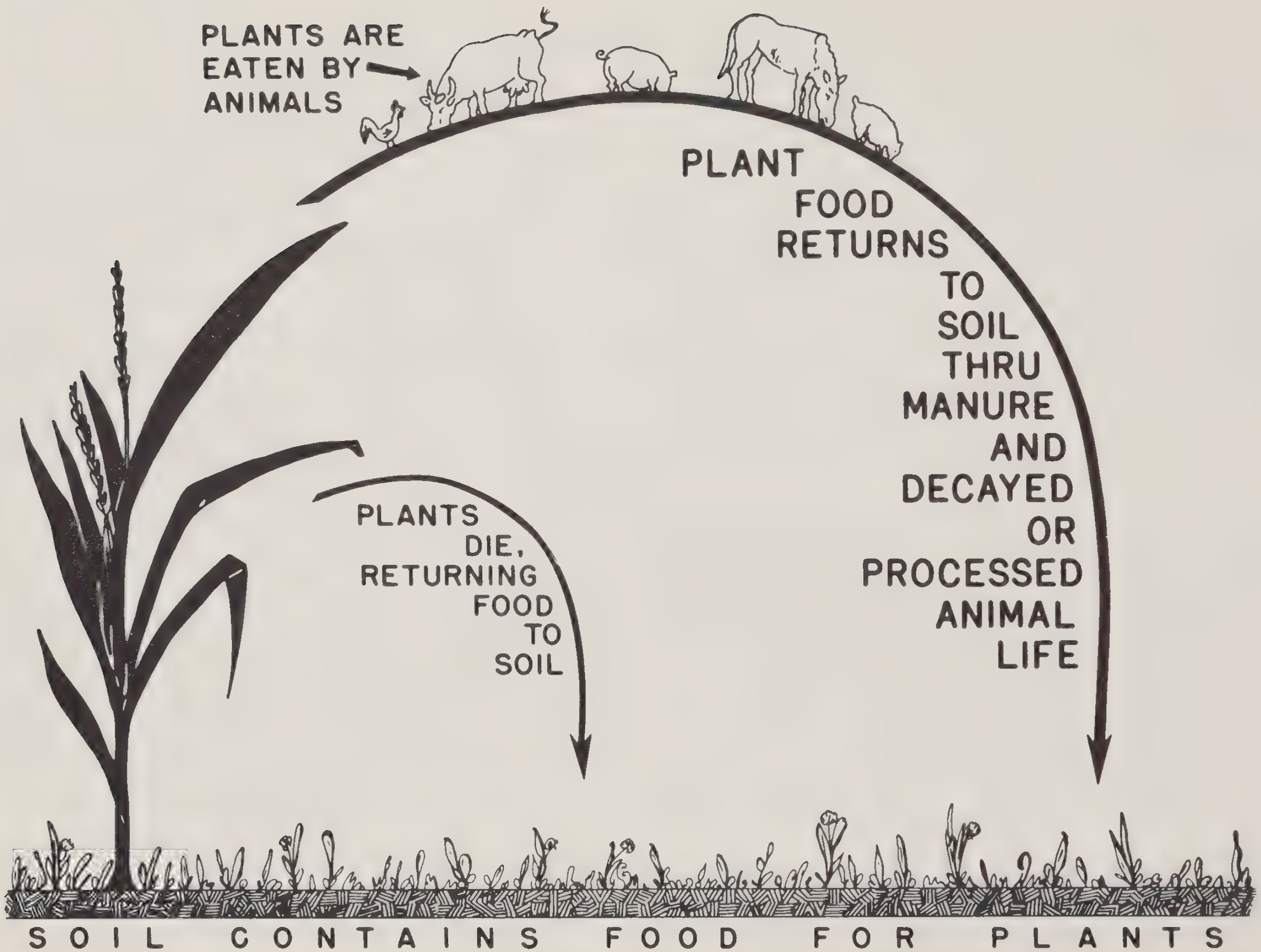
*or dairy

Urban-Rural, Rural-Rural conflicts:

Law:

Under the law of private nuisance, one whose person or property has been injured by a harmful substance discharged into water or into the air has a cause for action against the person or firm responsible. Injury from excessive noise or odors could be the subject of a nuisance action also. With livestock and poultry operations, the following might be nuisances if they interfere with the free movement on, or use of, property: decreasing the value of or profits from property; offending the sense of smell, hearing or sight; causing of inconvenience, bodily discomfort, mental distress, or injury to health; allowing of manure solids or other waste-derived pollutants in surface or underground water; offensive or otherwise objectionable noises, or excessive flies, rodents or other pests originating from such operations.[18]

Major causes of societal conflicts which precipitated civil proceedings in various cases of law, which were upheld, were: noncompliance with zoning regulations; offensive odors exhausted from totally enclosed, mechanically ventilated buildings within which manure and wasted feed were decomposing anaerobically; offensive odors released from anaerobic lagoons; offensive odors originating from manure decomposing on open lot surfaces; and surface water pollution caused by runoff transported manure from open lots. Other causes included objectionable noises, excessive flies and rodents, manure spillage on public highways, and suspected groundwater pollution.

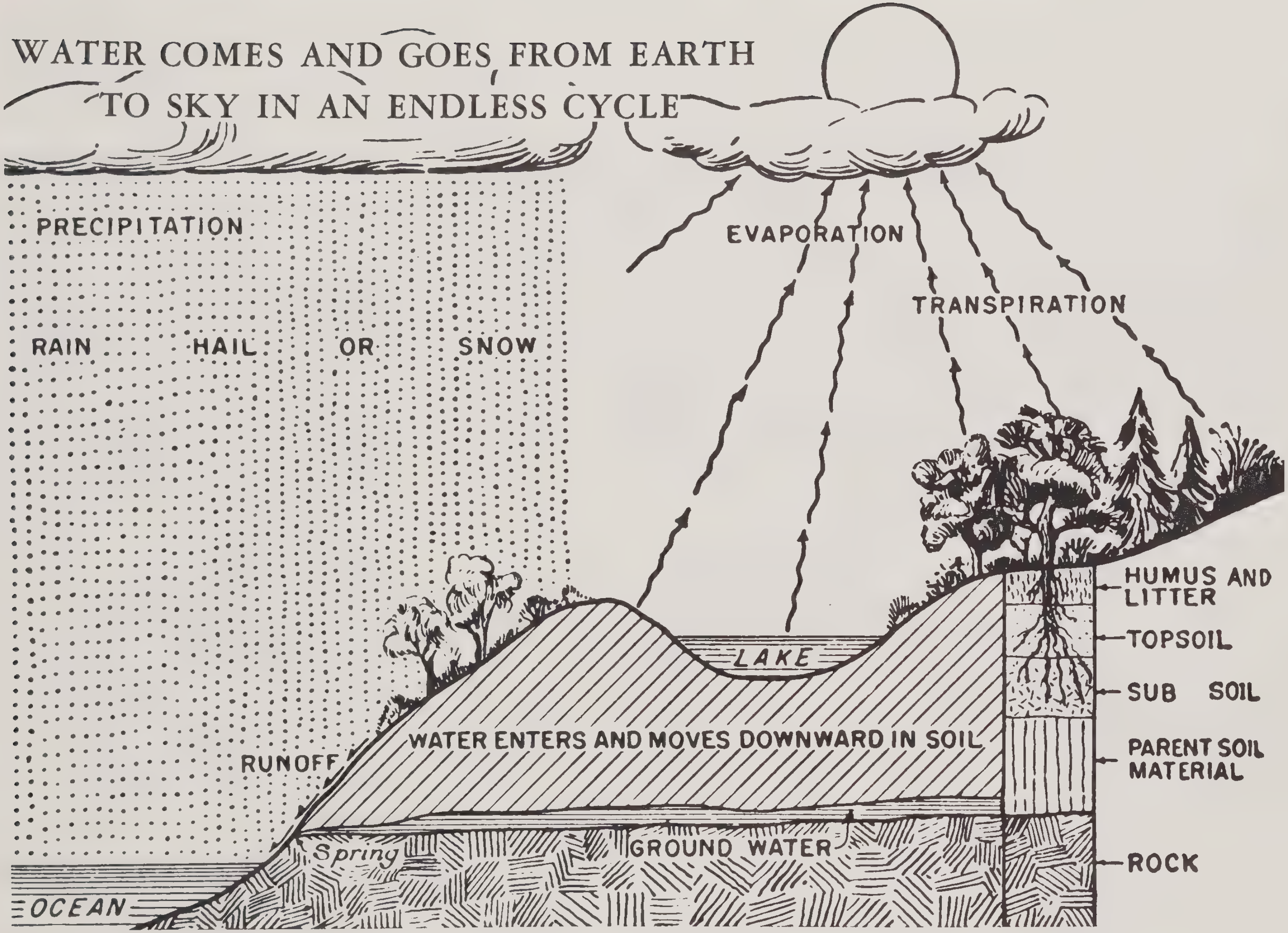


THE NATURAL CYCLE

U.S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE

7-0-13000-35-L

M-1800-208



U.S DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE

7-0-13000-208-L

There is often a lack of appreciation by second and third generation urban dwellers of the problems involved in livestock farming. This situation is made worse by the movement of urban workers to semi-rural areas ("I want a home in the country" syndrome), who, on finding neighboring farms using liquid manure handling systems or concentrated animal housing, complain of noise, smell, flies or unsightliness. The farmer is sometimes at fault, particularly if he sold off part of his farm for suburban building development without first evaluating the difficulties which could arise with conflicting land uses. The urban community fears the danger to health from waste disposal systems which are used by farmers with intensive livestock concentrations. Large livestock farms, even under the best management, sometimes cause a nuisance, and great care must be exercised in locating near urban development.

The number of urban-oriented, rural residents and open country recreational activities is increasing, thus raising a higher likelihood of problems connected with agricultural waste disposal in rural and suburban areas. Past attempts to solve the problems associated with animal waste disposal have failed because of attempts to use approaches developed for wastes of other characteristics, to emphasize first cost cheapness rather than adequacy of method, and to consider the problem as separate from other aspects of farm operations.

Suitable remote sites for confinement production of animals away from rural dwellings are becoming difficult to locate. Such operations must have some protection from indiscriminate subdivision locations or other non-planned urban uses. Thus, until effective solutions to the odor problems are achieved, rural zoning would appear to be a logical device, since in established areas where housing has moved to the suburban feedlot and intensive animal concentration interface, it is usually the feeder or dairyman who is forced to move. Such zoning would set aside certain areas for livestock production in which the odors from livestock enterprises, operated in accordance with currently accepted procedures, would be acceptable. In such an area, just as in urban industrial development, anyone living in zones which are designated areas for livestock and poultry production would be obliged to accept the odors associated with that appointed use of the land. Because of the general lack of effective land use regulations of this nature, considerable court activity has occurred in an effort to resolve the problems of conflict between livestock producers and residents nearby. These are generally under public nuisance laws, where public nuisance (as mentioned above) is defined as anything offensive to the senses which would essentially interfere with the comfortable enjoyment of life or property.

Zoning could stipulate a specific distance from intensive animal operations and reserve the area for agricultural uses, maintaining it as a "buffer" zone. Such agreements would allow protection against legal action from residential and recreational development after a feeding operation is established.

Tulare County today uses a synthesis of General Plan Elements, including Land Use, Open Space, Conservation, and Recreation, and "exclusive" Agricultural Zones, together with Use Permit procedures to designate areas to embrace new dairies. These planning and regulatory devices were prepared with direct input from local agricultural people themselves. They are flexible enough to adjust to improved technology or systems development in the future but protect and direct animal raising operations to avoid some of the problems cited above.

Rural-Rural Conflicts

In addition to rural-urban conflicts, conflicts arise between various types of agricultural enterprises. Different aspects of agricultural development, of course, need different irrigation, pesticide and dust control, and controls suitable for one type of production can have adverse effects upon another.

In general, large animal concentrations do not usually peacefully coexist with such crops as citrus, cotton, grapes, deciduous fruits and vegetables, for various reasons. Some sprays must not be used around cattle silage, particularly when used to feed dairy cattle. In addition, fruit packing and processing industries also are not compatible with animal operations. Pesticides, of course, cannot be used upon directly edible crops such as fruits and vegetables, or places where these are processed, and since most pesticides are applied by airplane, there is a certain amount of unavoidable drift, depending upon wind velocity. As a general rule, a buffer zone of 1/4 mile upwind and 1/2 mile downwind will avoid this problem. Use of such crops as corn, milo, wheat, or rye for buffering is recommended.

Dust is also a problem for citrus, cotton, grapes, deciduous fruits and vegetables. It lowers the quality of the fruits and vegetables, and in cotton and vineyards enhances the development of spider mites, which are a serious pest there.* Here again, a buffer zone of 1/4 mile upwind and 1/2 mile downwind will minimize the dust drifting to adjacent cropped areas of these types. Brucellosis and rednose, diseases of cattle, may be transmitted short distances by dust also, so that it is desirable to separate individual herds in order to prevent spread of disease.

*See "Spider Mites" Grape Pest Management in the Southern San Joaquin Valley, Agricultural Extension Service, Tulare County, June, 1973.

The problems of poultry waste management are similar to those of animal waste. Airborne waste, in the form of dust, can become a serious downwind problem. The dust is obnoxious to people, can clog air conditioning filters, and may become the aerial vehicle for mites or bacterial or viral caused diseases. The major turkey raisers, with large flocks such as that shown in this picture, generate large volumes of extremely rich manure. Great care must be taken in reuse of this manure so that ground, water and air pollution, as well as crop damage are avoided. Controlled water sprinkling, mechanical removal, and care in site location are the usual means to avoid the listed problems.

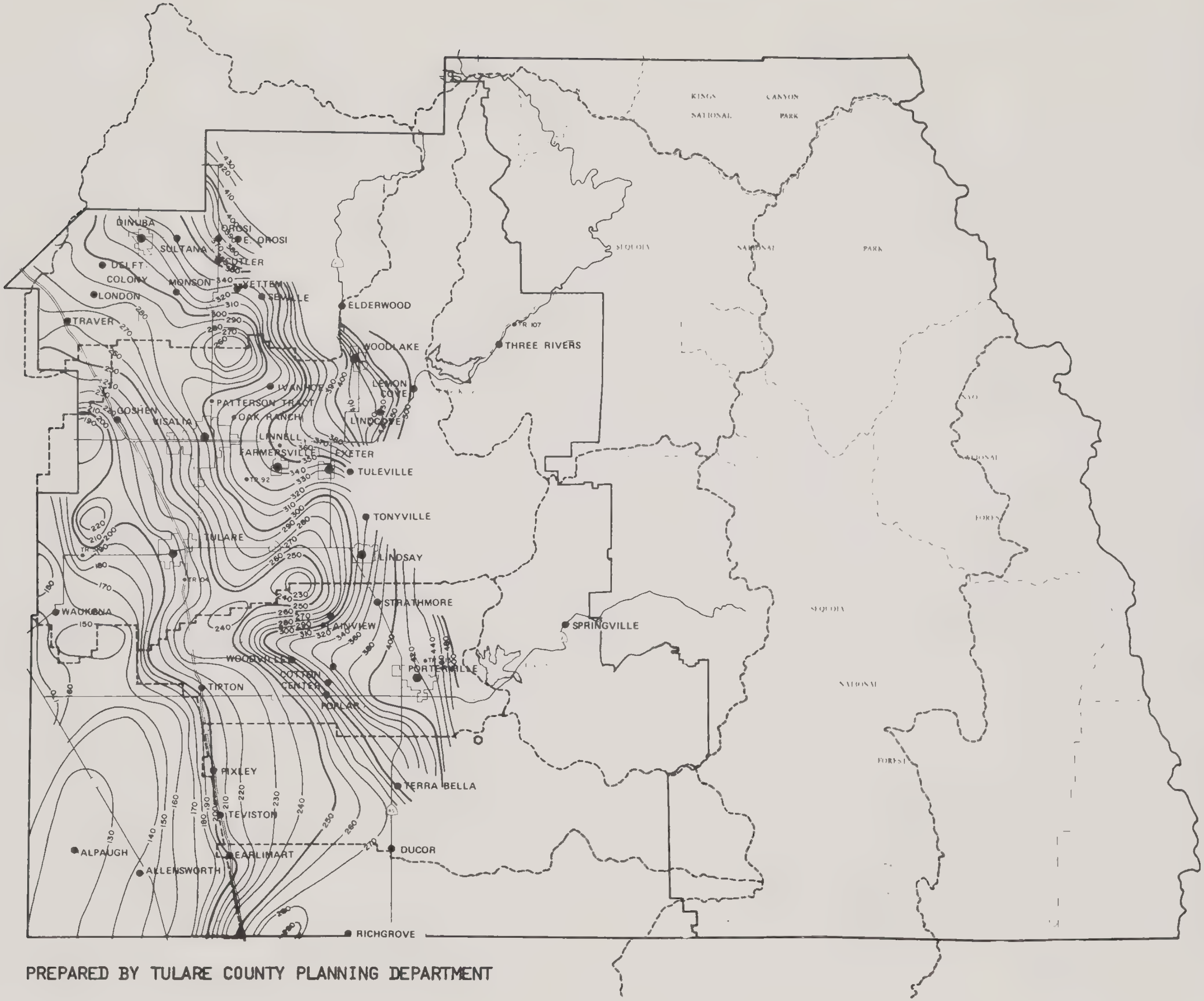
Turkey Farm near Tulare
5/16/74

HIGH WATER TABLE CONTOURS

HIGH WATER TABLE CONTOURS

The level of the water table is important in connection with determining possible pollution potentials of both manure collection lagoons and of irrigation with effluent from large animal concentrations. If the water table is close to the surface, it is easy for the groundwater to become polluted in areas of porous soil. Therefore, special precautions must be taken to seal the bottoms and sides of the lagoons or to raise the dikes and bottoms of the lagoons above ground. It is also important to use minimal amounts of effluents for irrigation relative to the local crop ability to remove nitrates and salts from the soil. A second solution, of course, is to locate dairies where the water table is at least 50 feet below the surface of the ground. Animal waste lagoons tend to seal themselves after a short time of operation. This, coupled with slow percolation rates, prevents contamination of deeper groundwaters.

HIGH WATER TABLE CONTOURS



LEGEND

-320- 1970 WATER TABLE ELEVATIONS (STANDARD FOR NORMALITY)

WATERSHED BOUNDARIES

SOURCES:

Comprehensive Framework Study, California Region, California State Department of Water Resources

NORTH

0 1 2 3 4 5 6 MILES

SCALE

PREPARED BY TULARE COUNTY PLANNING DEPARTMENT

PREPARED BY TULARE COUNTY PLANNING DEPARTMENT

Chapter II

Trend Analysis

CHAPTER II

TODAY'S TECHNOLOGY

The most troublesome problem with the concentration of animals and poultry for food production, whether it be in the form of meat or other types of food such as eggs and milk, is the prevention of pollution. Although the situation seems self-evident, it is often overlooked until, along with the concentration of production, comes concentration of the polluting by-products, whether the production involves steel, paints, or food. The American economy is based upon mass production, seemingly is committed to that ethic, and therefore has also committed itself to the efficient solution of pollution problems, concomitant with such production. The family farm, with its limited numbers of livestock had few "pollution" problems to deal with, and they were relatively simple; densities were low, and the potential materials of "pollution" were recycled on the same farm. Manure from both poultry and livestock was used as fertilizer; used bedding was disked into the soil for humus; wastewaters, if there were any, were also channeled into the fields for fertilizer. Family cats took care of the mice and rats. Crop variety helped to avoid some insect pest problems.

On the other hand, the massive amounts of wastes produced by large numbers and high densities of animals cannot be disposed of on the small areas of land upon which some earlier dairies and feedlots were situated; the odors and dusts generated carry for longer distances; and vector control becomes difficult. Human densities have increased throughout the hinterland while human tolerance of farm effluents have declined. Regulations become desirable alternatives to reduce conflicts.

Waste Treatment System

To solve the problems of manure disposal, many types of treatment have been used. These include aerobic and anaerobic lagoons, combinations of both, composting, both with or without aeration, oxidation ditches, dewatering wastes before disposal and land disposal both of liquid slurries and untreated manures. Understanding of these different methods will point out the advantages and disadvantages of them and will help in choosing which may be best suited to a particular operation.

ANAEROBIC LAGOONS:

One of the first efforts at a more sophisticated type of treatment was the anaerobic lagoon. It was a take-off and often a direct copy of the anaerobic lagoon used in the treatment of human waste and therein arose the chief difficulty. Such systems were often designed as though they were to treat human wastes and ignored the fact that the composition of human and animal wastes is radically different. It is well to note, then, that their purpose generally should be the removal, destruction, and stabilization of organic matter and not water purification. The lagoons provide excellent settling capacity for interception and separation of heavy solids from liquid flows.

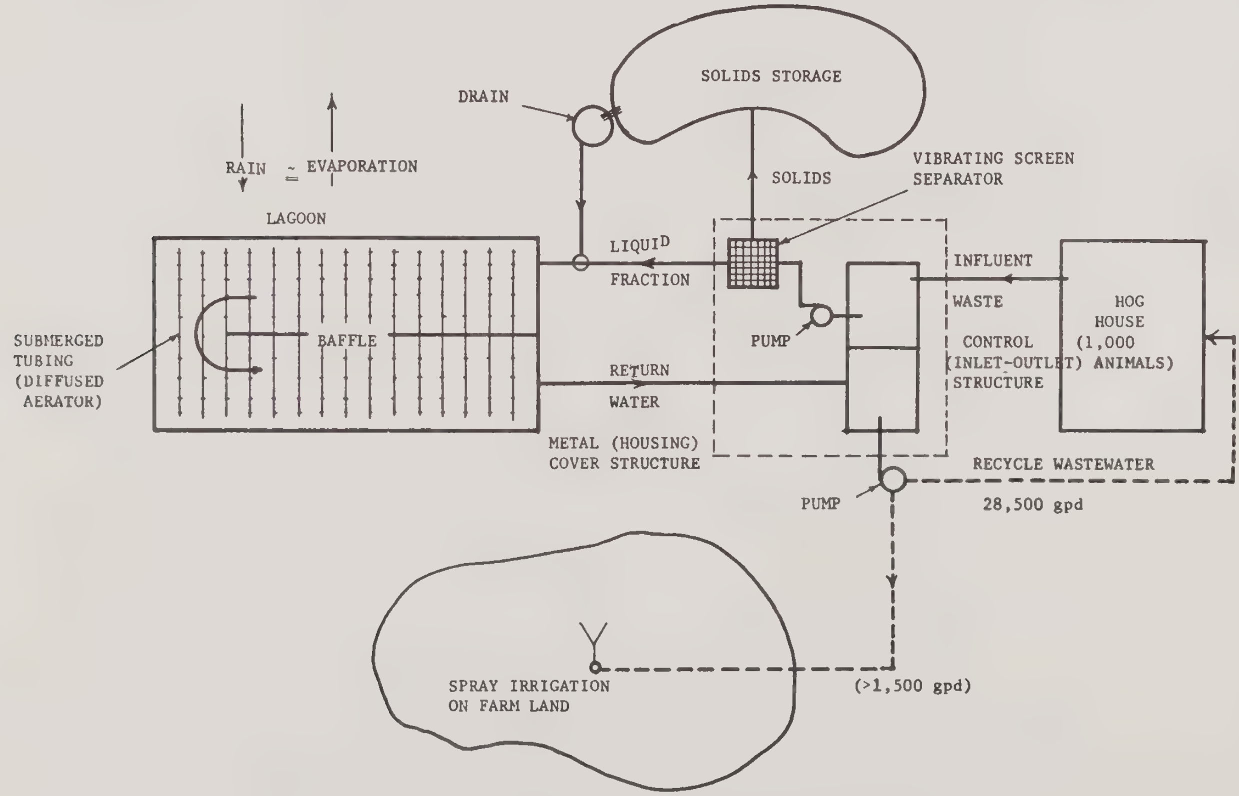
The solids entering an anaerobic lagoon will decompose, with the rate depending upon such environmental factors as the temperature of the lagoon, the degree of mixing that takes place and the pH and the alkalinity of the lagoon; much of the hydrogen, carbon and oxygen will be removed from the soluble portion, in the form of methane and carbon dioxide.[20] However, large particles and fibers remain almost unaffected. The effluent generally will require further treatment before discharge to the environment. Since considerable gas is evolved, there is almost always an objectionable odor present. These lagoons are relatively cheap to construct and do not require a great deal of maintenance other than cleaning of the solids build-up at regular intervals. (Often regulated by salt build-up: should be cleaned when TDS [total dissolved solids] approaches 1000 ppm.)

AEROBIC LAGOONS:

An attempt to improve upon the objectionable features of the anaerobic lagoon brought about the construction of the aerobic lagoon, with either natural aerobic features or mechanical aeration. Such a lagoon provides for much more continual bacteriological action and eliminates the odor, if properly operated. In addition, the effluent is usually well-mixed, and therefore easier to dispose of in the slurry form. If no mechanical aeration is provided, lagoons must be no more than three or four feet deep, which means large amounts of land are required. Manure can only partially stabilize, even over long periods of time.

The readily usable or degradable substrate is used rapidly by the aerobic culture, but the slowly degradable material resists use and some dairy wastes aerated for approximately 182 days still contain about 75 percent of the volatile solids in the dry matter.[3] Left unaerated, the material goes septic and produces odors.

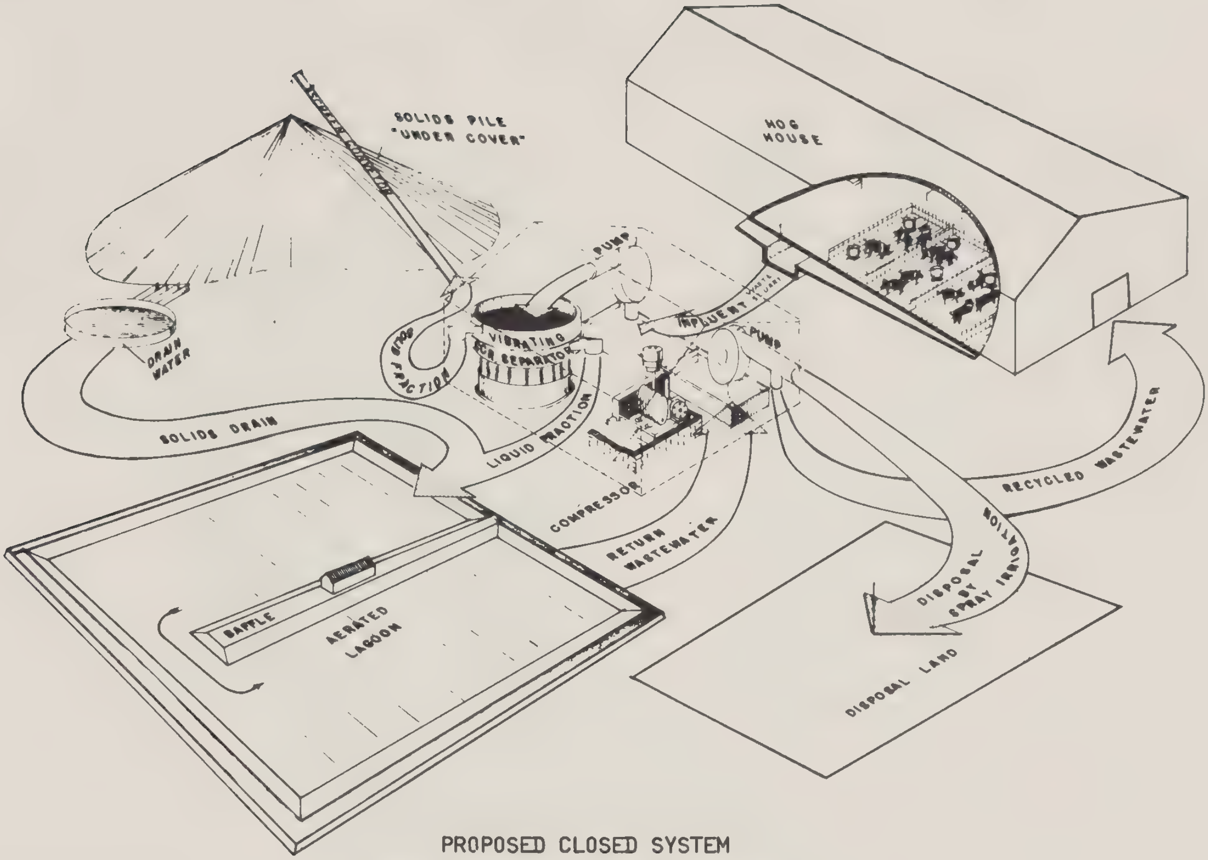
Lagoons designed for mechanical aeration may be 15 to 20 feet deep and become much more feasible when the treatment process is not limited by the rate of oxygen transfer into solution, however, large power demands may prove of significant expense. A solids removal system is needed, but even with the best of systems the BOD5 (measurement of pollution potential) is only reduced by 50%. A typical unit might include an aerobic lagoon with diffused aeration, a solid-liquid separator, pumping station and automatic flushing equipment.



LAYOUT OF PROPOSED WASTE MANAGEMENT SYSTEM

Primary features of this waste management system include: (a) an in-building automatic flushing system; (b) a vibrating screen separator which removes solids prior to lagooning liquids; (c) control structure large enough to contain an air compressor (heat from the compressor can be conveyed and utilized as a heat source for barns or other farm buildings in winter) and the vibrating screen separator; (d) an aerated lagoon equipped with a diffused aeration system consisting of submerged perforated plastic laterals branching from metallic main pipes connected to the air compressor (a unique feature of the lagoon is that it is baffled to maintain proper solids removal); (e) pumps and connecting lines; (f) a solids storage space under cover, draining into the lagoon, and equipped for self loading and unloading; (g) portable spray irrigation equipment for soil disposal of the lagoon effluent under favorable weather and crop conditions.

All these features were derived originally through constraints imposed upon waste management by acceptance of environmental responsibility. As a practical matter, substantial efficiencies have been achieved in these terms for the animal producer, as well as increased milk production.



PROPOSED CLOSED SYSTEM
WASTE MANAGEMENT FOR LIVESTOCK.

A significant, relatively recent, labor-saving development in animal waste management is the hydraulic handling and transport of animal manures in confined livestock operations. In addition to their labor-saving advantages, these systems provide an overall cleaner, safer, odor-free and more attractive environment for both the producer and the animals.

Treatment of used water after emergence from the buildings, through lagooning, translates it into acceptable irrigation water which can be sprinkled or spread on adjacent crop lands. Additional advantages of such enclosed operations are efficient treatment techniques and limitation of total bulk of pollution, thus minimizing long range costs of animal production.

COMBINATION SYSTEMS:

Combination anaerobic-aerobic systems may produce an effluent which meets desired water quality standards. An anaerobic unit can serve to equalize any periodic slug loads from confinement feeding operations and can provide for partial degradation, solubilization, and gasification of organic matter. The aerobic unit can provide aerobic stabilization of the soluble and remaining particulate matter in the aerobic unit effluent. Additional units for removal of the biological solids in the effluent may be necessary in certain cases. Such combination systems can be useful when animal wastes cannot be distributed upon the land.*

*Swine raising, utilizing large doses of antibiotics in feed rations may allow sufficient passage of such elements through the digestive tract to severely limit biological treatment of manure unless it is diluted sufficiently so that toxic concentrations of these antibiotics do not develop.

OXIDATION DITCHES:

In the oxidation ditch process, the wastes, which are either directly dropped or pumped into the ditch, serve as a substrate for microbial decomposition. The wastewater slurry is mixed and oxygenated by a continuously operating mechanical surface rotor, which keeps the wastes circulating so that the solids are kept in suspension.[3] It also supplies the necessary oxygen for aerobic bacteria to work. The effluent from the oxidation ditch still must be returned to the land, but with proper design, completely aerobic and odorless operation is possible, and with proper management, oxygen demanding materials, solids, and nutrients such as nitrogen can be removed, to a large degree, and return to the land can be accomplished with minimal pollution hazard. Oxidation ditches do tend to foam, and large undigested materials tend to settle out, sometimes restraining the flow in the ditch.

COMPOSTING:

The composting of dairy manure, by removal from the loafing barn to a composting floor, where the stacks are either stirred or air is forced through them by blowers, has been quite effective. The rate of stabilization is greater with high roughage content than with all concentrate feeds (probably because of the higher degree of compaction from small-sized particles in the concentrate feed, which restricted the flow of air through the mass).

The moist waste is extremely attractive to flies, increasingly during the very early stages of composting, until the temperature of the mass exceeds 50 degrees Centigrade for over 24 hours. During the later stages of composting, no fly attraction or activity is noted. The high temperature of aerobic stabilization kills the larvae and eggs in the mass, and no live larvae is found after composting. The optimum oxygen supply for peak composting ranges between 1.5 and 3 liters per minute per 100 pounds of organic material.[8]

Composting requires considerably more time in open air piles than in controlled digesters since the stabilization process does not progress uniformly. (When dense lumps of waste exceed one inch in diameter, aerobic stabilization occurs around the surface, while the center of the lump remains anaerobic.) The time of stabilization depends upon the type of the original feed material, the condition of the waste at the start of the composting period, and the management of the composting process. However, if properly managed, it is a feasible process. It is well adapted to bulk handling and improves the usefulness and acceptability of the product by eliminating offensive odors and fly attraction. Dry matter can be reduced by about 60%, total weight by about 80%, and moisture content from 50 to 75 percent.[3] Manure can then be returned to the loafing barn to be reused for bedding, be sold for humus or transported to the fields for use as fertilizer in feed production.

Dewatering:

Dewatering of farm slurries from dairy cattle housing, using drying beds, has been explored, but measurements of specific resistance to filtration showed that these slurries would have only a small amount of water removed by draining, and that evaporation of the remaining water would take an excessive amount of time.[20]

Barriered Landscape Water Renovation System (BLWRS):

This system is a refinement of the use of the soil complex as a unit process for achieving tertiary (95% plus) levels of waste treatment. It involves the modification of the soil by constructing a bench terrace type of structure. The upper portion of the structure contains limestone or slag to chemically absorb phosphorus, with the lower or downhill portion of the terrace designed to anaerobically function to provide denitrification.[3]

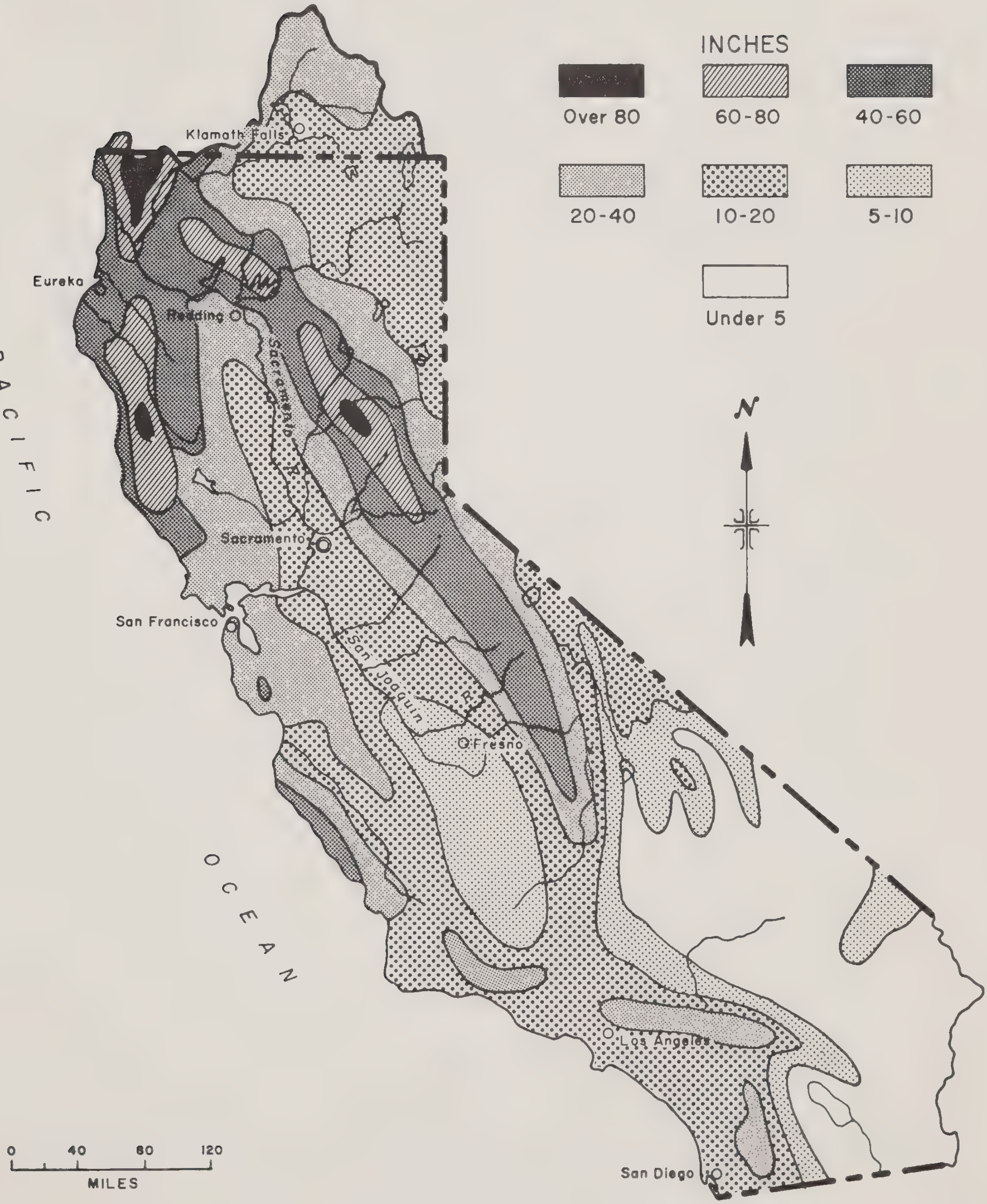
A typical system (see diagram) would have:

1. A sheet of plastic at the bottom;
2. Then two feet of subsoil, mixed with energy food for bacteria, such as ground corn or molasses, about one part to five parts soil;
3. Then four feet of topsoil, mixed with limestone or slag;
4. Then on top a sprinkler system for disposal of liquid manure.

Preliminary data shows overall organic and nutrient removal efficiencies of 98 percent and greater when the BLWRS is used to polish effluent from anaerobic lagoons, so that it can be thought of as a part of a larger system. The renovated water then moves off the edges of the barrier, through deep soil layers, to the water table.[18]

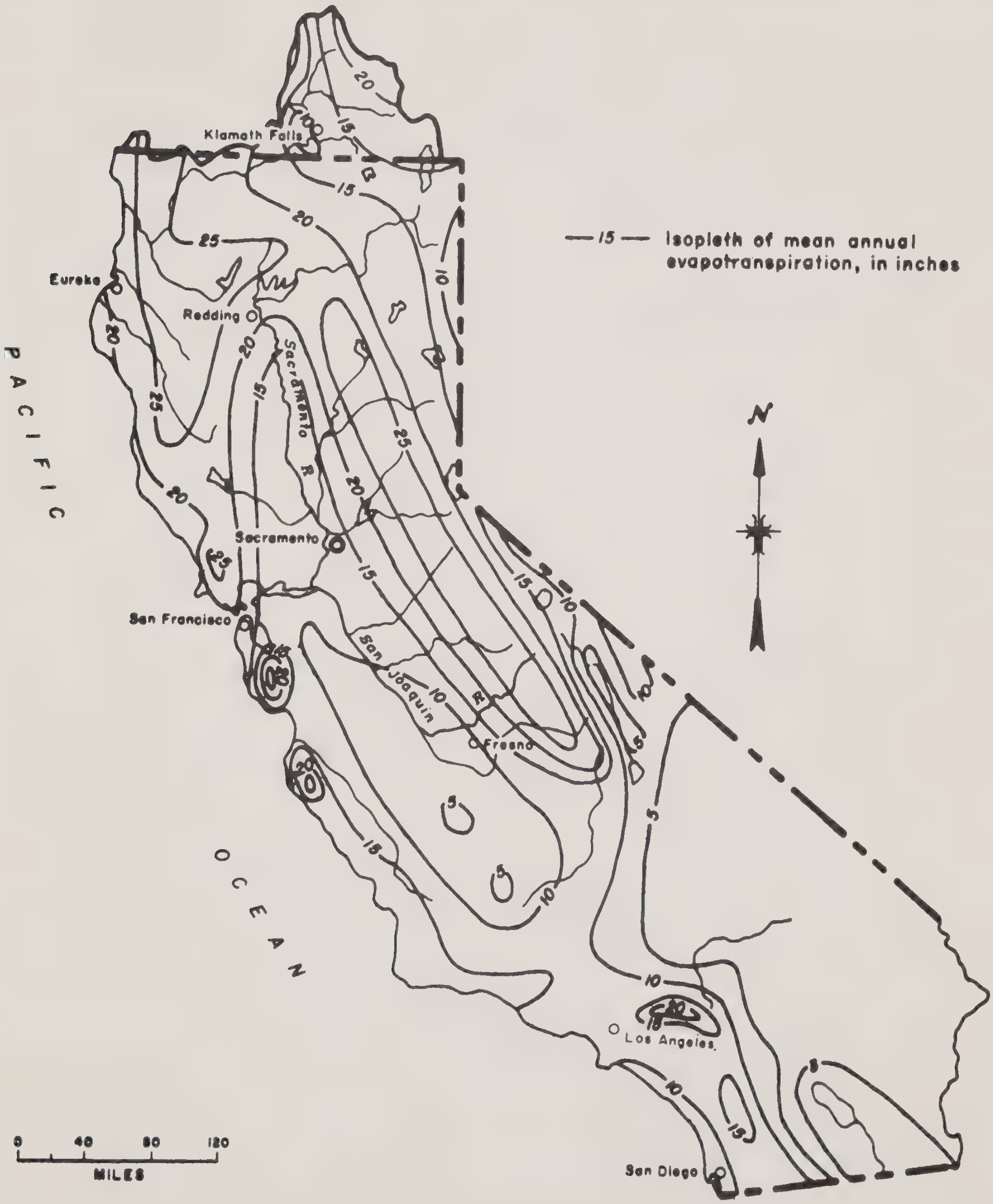
CALIFORNIA REGION

MEAN ANNUAL PRECIPITATION



The precipitation map for California reveals that the valley has an annual precipitation rate of from 0 to 20 inches. Addition of this factor into the designed capacity of sewage lagoons for collection of wastes and runoff will indicate maximum holding capacity necessary.

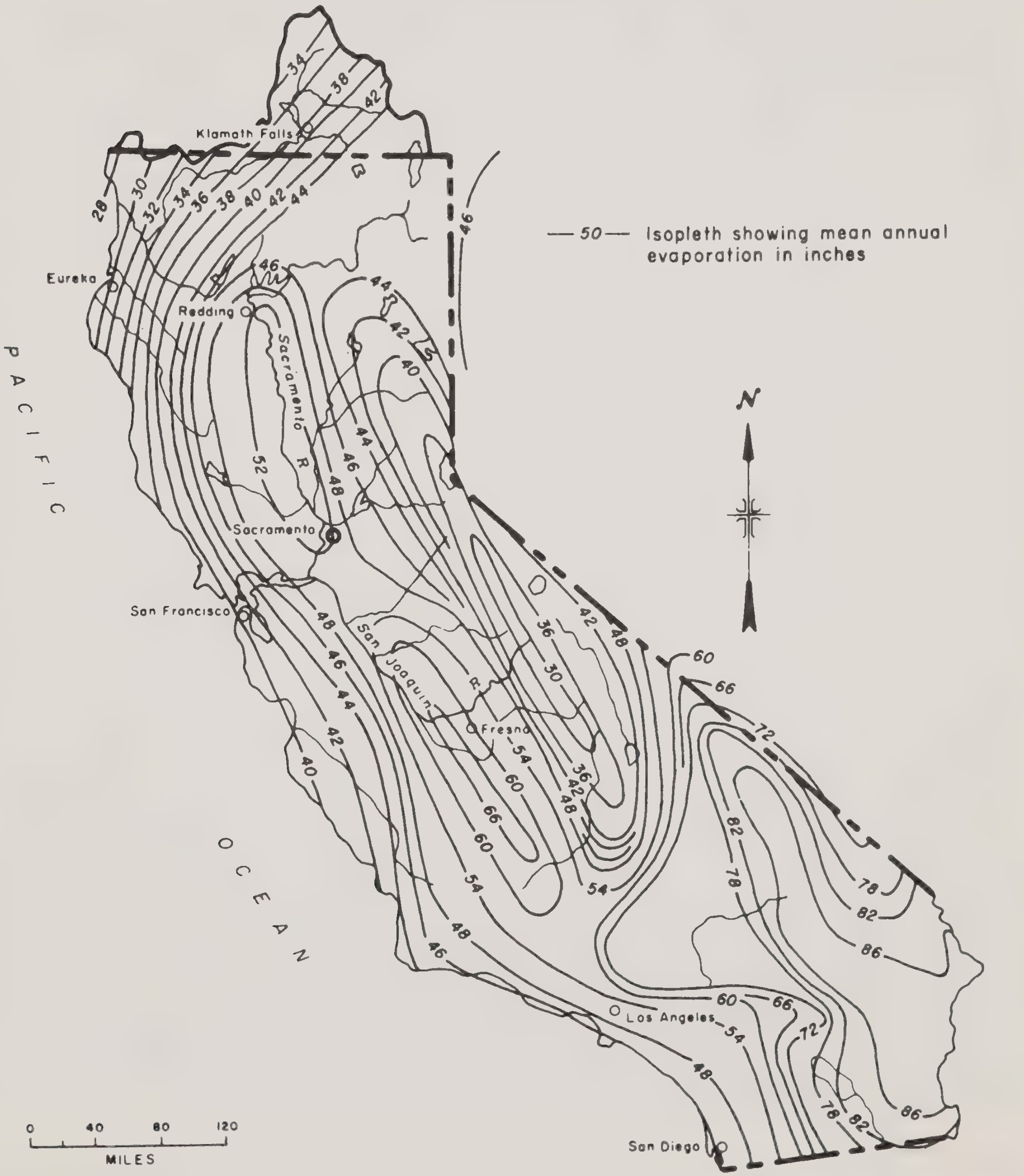
MEAN ANNUAL EVAPOTRANSPIRATION FROM NONIRRIGATED AREAS



Evapotranspiration, or the water withdrawn from soils by evaporation and/or plant transpiration, is influenced by the same climatic factors that effect evaporation from a free water surface. These factors determine the upper limit of loss that is the potential total evapotranspiration. In areas where there is no irrigation, under arid and semi-arid conditions, evapotranspiration will frequently be almost equal to precipitation. On the other hand, in areas where irrigation is practiced, the effect of precipitation on evapotranspiration is of lesser impact. This map, with regard to disposition of animal waste, gives an indication of how much evaporation and/or utilization of liquid waste can be expected under natural non-irrigated conditions. Particularly useful in the case of feedlots, this information will help in design of sewage lagoons. The lines (imaginary) on the map indicate the mean annual evapotranspiration in that particular area.

CALIFORNIA REGION

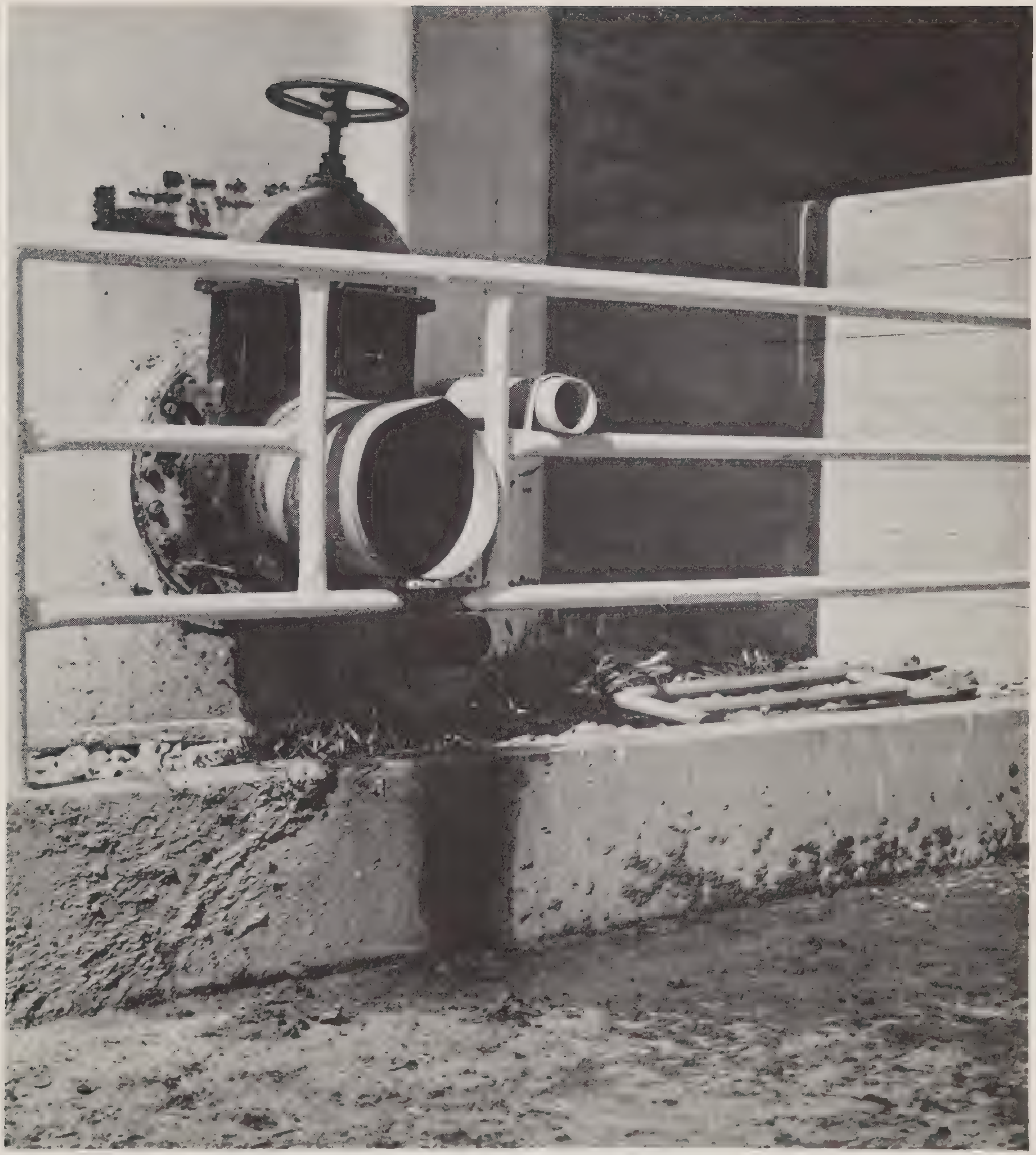
MEAN ANNUAL EVAPORATION FROM SHALLOW LAKES AND RESERVOIRS



After Kohler and others (1959)

This map indicates how much water can be expected to evaporate from sewage lagoons over an annual period. For most of the valley, the maximum amount is 66 inches per year.

This substantially decreases the capacity necessary in the runoff lagoon for a large animal concentration facility. Thus, solar energy becomes a water-transport device; removing waste water from the lagoons.



Recycled waste water, amended with fresh water, pours from a storage tank through this pipe into carefully designed, sloping waste collector aisles in the modern dairy barn to flush out all wastes at periodic intervals during the day. Such cleaning action makes the modern barn free of flies, dust, and odor and provides a healthy environment for the animals as well as for the operators of the dairy facility. Although this flushing system is manually operated, some new designs use automatic controls. Such high use of water as a waste vehicle requires reconstitution of water quality for reuse on the dairy, particularly as the price of new water increases.

Santos Dairy
5/9/74

Gutters of the dairy animal shelter building are flushed to control odors and dust, which can be of health significance to the animals. This process removes manure as it is defecated, before it begins to decompose. It also removes the material before fly larvae can hatch. Heavy flows are necessary to completely clean the gutters, and pitch design of gutters is important so that flow will be uniform from one end to the other and will flow from the sides toward the center to complete the flushing action. The flushing water is cleaned and reused.

5/9/74

The trend in modern dairies is now toward confinement and completely covered areas. Both feeding and loafing are often included under the same roof, as in this barn. Wastes are flushed from concrete aisles with constantly reused water. (Solids are separated out in a unit at the end of the barn so that the waste water can be recycled.) Length and width of stalls are carefully designed with regard to the characteristics of particular breeds of cows so that wastes will be deposited in the concrete aisleways and not in stalls.

5/16/74

Here, small sprinklers are used to clean the corners of the barn and stalls where there are places which are hard to reach with the larger flushing systems. The clean, cool barn contributes to animal health and productive efficiency as well as eliminates dust, odors, flies and other unwanted byproducts of the operation.

Santos Dairy
5/9/74

After the cow waste is flushed from barn with recycled water, it enters a tank with a raised centrifugal pump (a) which separates the cellulose solids from the liquid. These solids are conveyed, on the conveyor belt system (b) to a drying area later to be used for bedding.

Louis Limas Dairy - Tipton
5/20/74

The undigested corn silage, hay, and straw, are removed from flushed wastes by centrifugal separators. A washed, solid by-product, much like wet sawdust, can be used for freestall bedding. This makes a useful product from a formerly discarded waste in this recycling process now being used in modern dairies.

Hydro-Shaker
5/9/74

A bunker silo is used for storing the cellulose or fiber material which makes up one-fourth of the organic material in cow manure. It is a complex humus which is so resistant to decay that it may be considered almost stable, and makes a very satisfactory bedding for use in the free-stall loafing barns and other modern dairy facilities.

Blocker Dairy
5/3/74

Liquid and slurry effluents from confinement units are evacuated into lagoons by flushing procedures. Here they are clarified and the reclaimed water is recycled through the animal shelter building gutters as flushing waters. Provisions to disinfect recycled water for odor and disease control can be incorporated into this system, if needed.

5/16/74

These lagoons are both aerobic (in the upper portion) and anaerobic (in the lower portion) when they are properly constructed to more than fifteen feet deep.

The effluent from these waste lagoons is not allowed, by State law, to enter surface waters. It usually is disposed of on land, in plant cover, in accordance with recommended application procedures. Commercial pumps and sprinkler irrigation systems can be designed and operated to utilize or safely dispose of sufficiently diluted liquid wastes.

In this picture, a floating pump is used to convey liquid waste to adjacent field irrigation systems.

Santos Dairy
5/3/74

Yarding areas for cows in a modern dairy are designed with a 1 to 4 percent slope so that water will not stand and collect in any one spot, but run off to peripheral collection ditches where it can be siphoned into collection and treatment lagoons and reused or distributed for managed fertilization of nearby cropland.

Blocker Dairy
5/3/74

DISTRIBUTION OF PRECIPITATION IN TULARE COUNTY

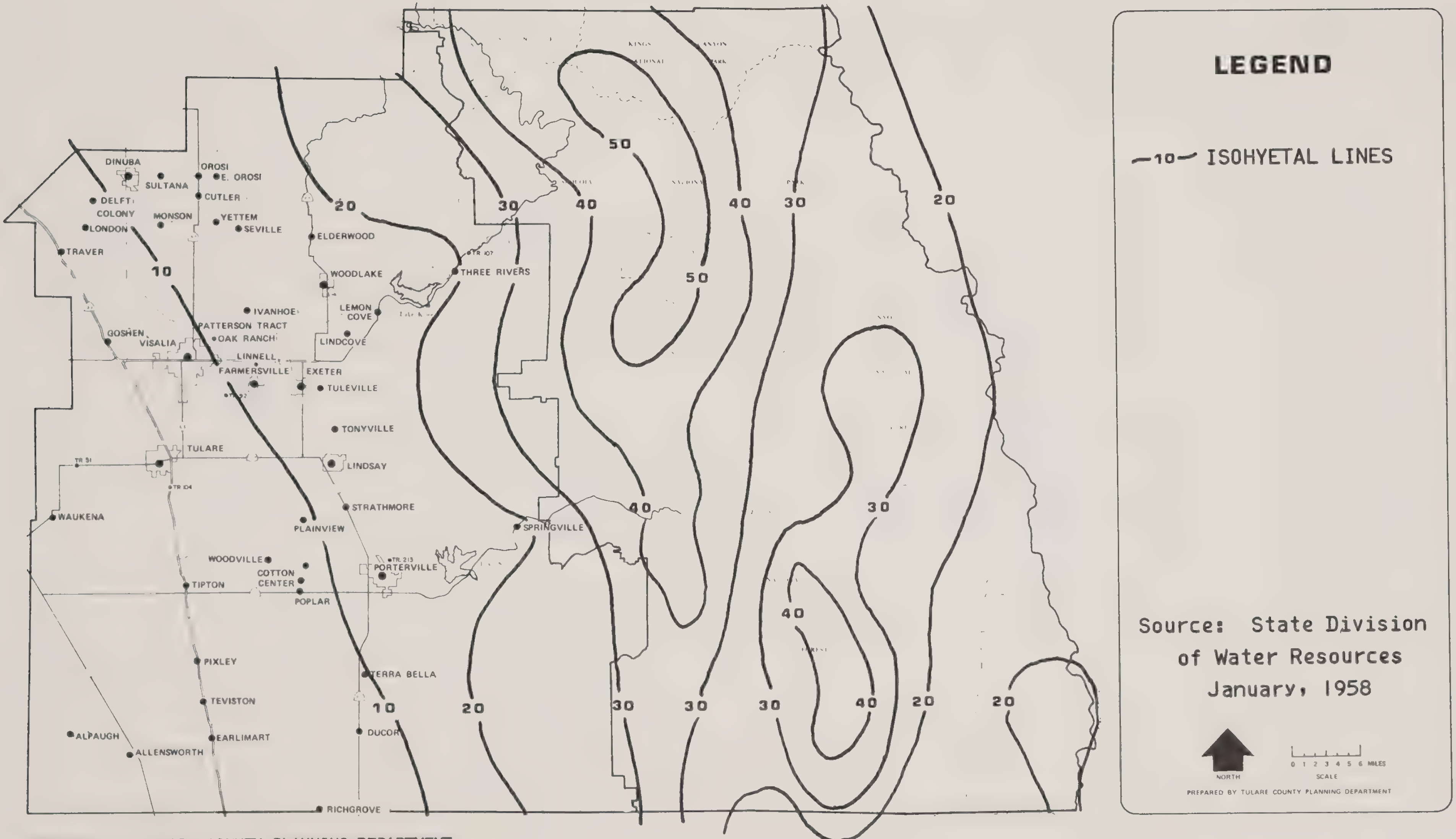
DISTRIBUTION OF PRECIPITATION IN TULARE COUNTY

About 85% of the annual precipitation in the County occurs during the period of November to April. The utilization of this map will assist in determining the storage capacity necessary in a sewage lagoon to allow for annual rain, in addition to liquid waste which may come from animals, to be stored in the lagoon.

The isolines, or lines of equal values of rainfall, on this map will help determine the amount of rain water which can be expected to supplement irrigation of croplands in addition to liquid waste being distributed through the sprinkler system or channels. If the rainfall occurred during the season when the area is subject to the greatest evapotranspiration, it would not constitute a problem in sewage lagoons. Since, however, it does normally occur during a time when the ground is already saturated, when the sunlight is limited and temperatures are low, rainfall needs to be considered as a factor in design of storage capacity of lagoons.

DISTRIBUTION OF PRECIPITATION IN TULARE COUNTY

MEAN ANNUAL PRECIPITATION FOR 50 YEARS 1897-1947

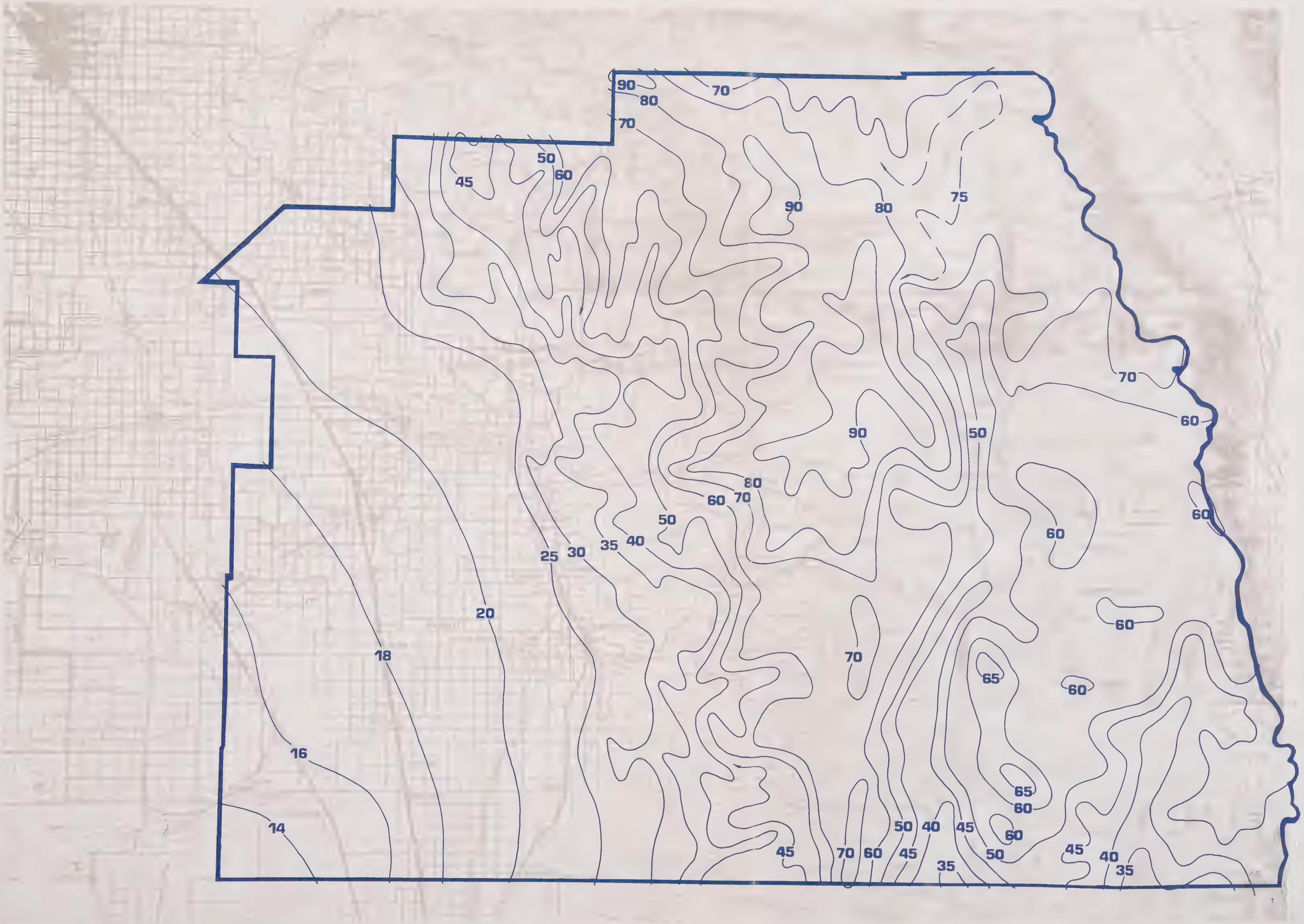


PREPARED BY TULARE COUNTY PLANNING DEPARTMENT

RAINFALL

RAINFALL MAP: 10 YEAR, 24 HOUR

Estimation of maximum capacity necessary for retention of runoff from areas of large animal concentrations can be determined by checking the maximum expected 24 hour precipitation rate on this map. The figures indicate maximum precipitation within 24 hours, in tenths of an inch; the maximum precipitation to be expected in many valley areas is less than 3 inches in any 24 hour period. These figures are useful in designing storm water runoff conduits and collection systems in animal waste management projects.



RAINFALL

TULARE COUNTY

LEGEND

30 — ISOPLUVIALS OF 10-YEAR 24-HOUR PRECIPITATION IN TENTHS OF AN INCH

SOURCE: U.S. DEPARTMENT OF AGRICULTURE

NORTH

SCALE

PREPARED BY TULARE COUNTY PLANNING DEPARTMENT

LAND CAPABILITY

LAND CAPABILITY MAP

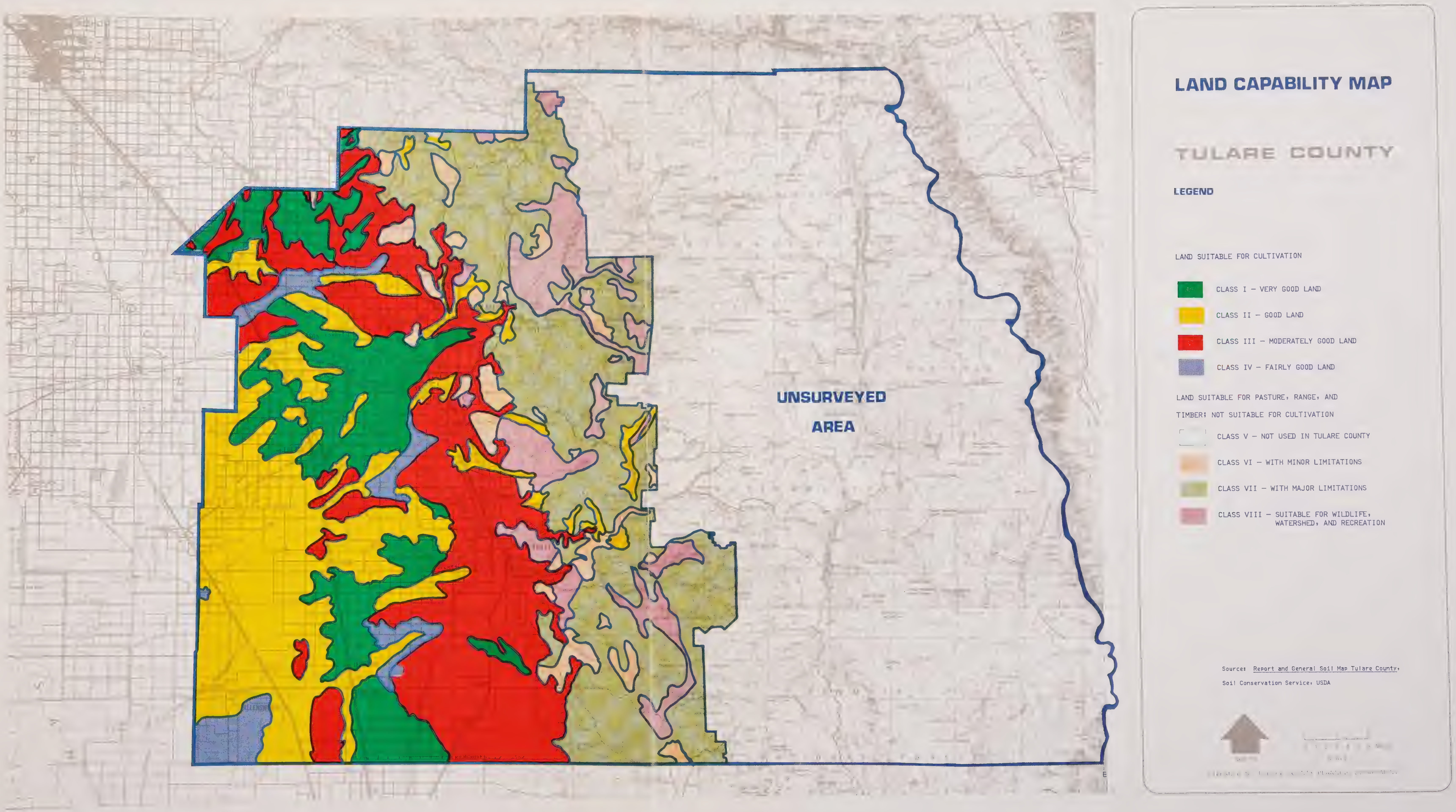
The land capability groupings on the map are intended to show the suitability of soils for most types of cultivated crops and pasture without soil deterioration over a long period of time. In general, Class I, II and III comprise the most important agricultural soils in the County. These are located primarily in the central valley where a long growing season together with the availability of irrigation water makes this area one of the most important crop producing regions of the nation. The Class I designation signifies that the land is suitable for sustained high yields of most climatically adapted crops with minimum costs of development and management. Class I is thus considered the best agricultural land. Class II and III lands are also characterized by high yields but are more restricted due to conditions such as existence of hardpan layers, fine textured soils, or low water holding capacity.

Class IV soils are also considered arable, but contain severe limitations in one or more land characteristics, such as high concentrations of salts and alkali. These adverse soil conditions limit the use of Class IV areas to pasture and grain production.

Class I-IV soils comprise the great majority of the valley area of the County. Only isolated topographic features such as Venice Hills, which extend into the valley, are considered inappropriate for cultivation. In general, the foothill and mountainous portions of the County contain lands which are suitable for pasture, range and timber production. These areas are illustrated by Class VI, VII, and VIII areas on the map. Classs VI and VII areas are considered suitable for grazing or forestry while Class VIII lands are best used for wildlife, recreation, protection of water supplies or aesthetic purposes.

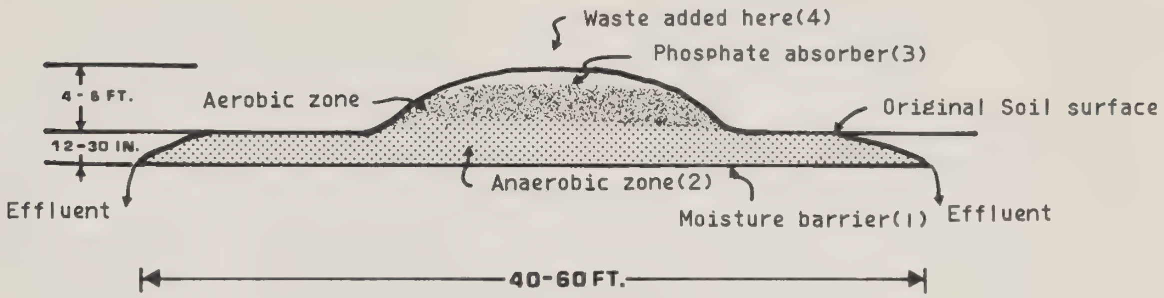
All other things being considered in terms of keeping the County agricultural base at its highest level, it might be wise to locate dairies on lands least capable of intense crop production of other types, such as Class IV and VI soils. However, since these soils appear in small quantities in the County on flat valley lands where dairies prefer to locate, this can only be a secondary consideration in dairy locations.

See also the map of "Soil Limitations for Septic Tank Filters" following page 56 in the Soils Element of the Tulare County General Plan (1974) for an outline of areas having poor percolation. "Severe" designated areas are naturally suitable for lagoons because of slow vertical water conduction. Other references in the Soils Element will be useful in these determinations.



LAND CAPABILITY MAP
TULARE COUNTY
LEGEND
LAND SUITABLE FOR CULTIVATION
CLASS I — VERY GOOD LAND
CLASS II — GOOD LAND
CLASS III — MODERATELY GOOD LAND
CLASS IV — FAIRLY GOOD LAND
LAND SUITABLE FOR PASTURE, RANGE, AND TIMBER; NOT SUITABLE FOR CULTIVATION
CLASS V — NOT USED IN TULARE COUNTY
CLASS VI — WITH MINOR LIMITATIONS
CLASS VII — WITH MAJOR LIMITATIONS
CLASS VIII — SUITABLE FOR WILDLIFE, WATERSHED, AND RECREATION
Source: Report and General Soil Map Tulare County, Soil Conservation Service, USDA
UNSURVEYED AREA

Schematic Cross Section of Barriered Landscape Water Renovation System[10] (3)



Liquid Handling:

After the various types of processing, there is still a problem of how to handle the liquid effluent. Liquid holding units and liquid disposal of wastes on the land, with holding tanks of two or more months capacity, provide for flexible application of liquid manure to suite the grower's convenience. A typical system for converting liquid manure into usable fertilizer consists of a standpipe, into which the liquid manure is discharged, which also receives irrigation water. This dilutes the manure into a slurry, which is then spread over the receiving acreage. Liquid manure can vary from 75-140 gallons per cow per day, depending on individual practices, such as large washing areas, sprinklers, etc. (Caution should be taken to prevent build-up of the slurry in the system which could back-up into a well from the standpipe, where the two systems are interconnected. Air-gaps solve this problem.) While the manure may not be as economical as chemical fertilizers for crops, nevertheless, use of it as fertilizer, in combination with use of the land as a disposal unit for large amounts of wastes from concentrated animal operations, makes an attractive combination. The most common systems make use of slotted floors and vacuum tank wagons or irrigation systems to convey liquids to the fields.

The trend toward free-stall barns and completely covered feeding areas is apparently changing the adaptability of the liquid manure handling system to the dairy operation. In this system all liquids are conserved, along with the suspended fecal matter, and only a small amount of additional water is needed to maintain an operable system.

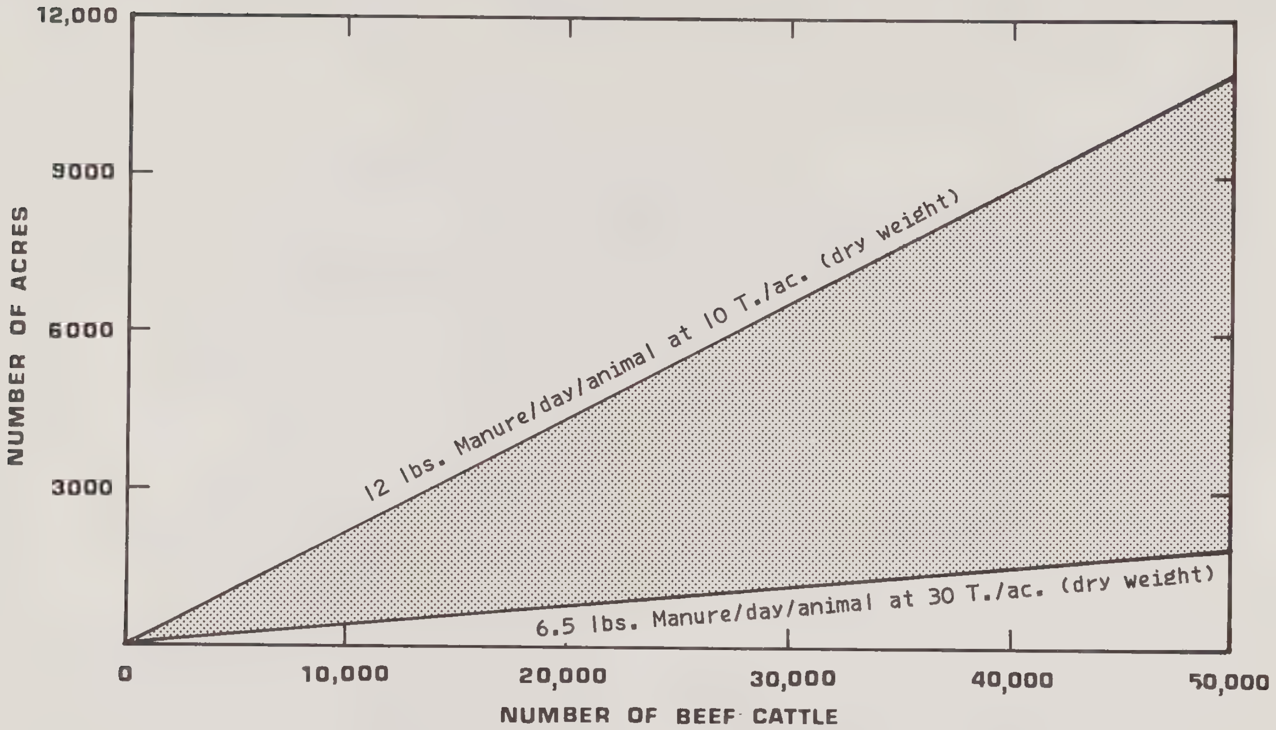
Many infections of livestock are spread in their excreta. The disease potential inherent in the use of the manure slurry systems to dispose of wastes on farmland is unique. It is possible, under certain circumstances, that the use of such systems could increase the disease hazard to man and animals. The possible presence of animal pathogens in runoff and effluent from waste treatment systems suggests that caution be exercised in reusing such water in and around animal production units.

In the liquid system, the collected manure is returned to the soil by either spreading as a thin layer on the surface, or injecting it into the soil (plowed under or injected about six to ten inches under the surface). The spraying on top has two objectionable features: the material remains on top of the soil where it may be readily washed off by rain; odors accompanying the spray are often highly objectionable. The injection method overcomes both these difficulties, but cannot be used in wet weather or when the fields contain crops. In addition, there is the possibility of contamination of groundwater.

Land Disposal:

Manure is one of the most logical ways to build and maintain fertile soils. Significant amounts of basic plant nutrients are provided, and the organic matter in livestock manure improves soil tilth, increases water-holding capacity, lessens wind and water erosion, improves aeration of the soil, and has a beneficial effect on the soil micro-organisms.[20] When the manure is added to crop lands, the nitrogen (N) contained therein is subjected to the same reactions as the N from commercial fertilizers, which are mineralization, absorption by crops, nitrification, and denitrification or leaching. Manure storage areas can generate point sources of excessive salts and nitrates into groundwaters if not properly managed. In addition, excessive addition of manure can increase nitrogen and salt content in soil and groundwater to levels injurious to crops and human and animal health.

LAND AREA REQUIREMENTS FOR DISPOSAL OF SOLID MANURE WASTES[5]



The acceptable application rate of solid manure ranges from 10 tons to 40 tons dry weight per acre depending on the type of crops, soil types and rainfall. The amount of land area in acres required to dispose of solid manure, (A_m) is equal to the volume of manure produced annually, (M) in tons per year, divided by the annual application rate in tons per acre, (R) or: $A_m = \frac{M}{R}$

Example: Using 21,900 tons of manure produced on a 10,000 head capacity feedlot, and a 10 ton/acre/year manure application rate the estimated acreage required for manure disposal is 2,190 acres.

Other Forms of Treatment

Some other methods used for disposal of wastes include evaporation or infiltration on the site, combining with glass for building blocks, squeezing into oil, synthesizing into proteinaceous materials and other products, feeding fish, growing algae, and producing methane and other gases. At this time it appears likely that no classical biological treatment systems in and of themselves will provide a sufficiently complete level of waste treatment. Even if biological systems reduce organic wastes up to 90 percent, effluent may still be stronger than raw domestic sewage. In any case, effluent from anaerobic lagoons, aerobic lagoons, oxidation ditches, activated sludge systems, or similar treatment systems will not conform to most existing water quality standards. Further action by soil organisms, other natural systems, or artificial means, would be needed to bring the quality up to current wastewater standards.

Nitrogen Loss During Storage, Treatment and Handling, for Various Waste Management Systems[7]

	Percent Loss
1. Oxidation ditch, anaerobic lagoon, irrigation or liquid spreading	84
2. Anaerobic lagoon, irrigation or liquid spreading	78
3. Deep pit storage, liquid spreading	66
4. Aerobic lagoon	61
5. Open lot, with or without shelter, solid spreading, runoff collected and spread	57
6. Bedded confinement, solid spreading	34

Pollution Control Solutions and Problems

Environmental pollution can be significantly reduced by using initial design stages for adequate facility planning, management, and, most importantly, by proper site selection. Many natural and artificial pollution controls discussed herein may appear to be initially costly; however, their long-range value can generate savings. Utilization of such things as local regulations, and information on, spatial requirements, topographic features, microclimates, soils and geologic substructures, as well as social factors is important. Waste handling and disposal practices have, in the past, resulted in pollution of surface and ground waters. In many cases these were accompanied by extensive environmental damage and fish kills.

Because of the extreme pollution potential of animal wastes, conventional municipal waste treatment designs are not considered to be economically feasible for use by feedlot or dairy operations without significant modifications. Firm commitments for manure disposal areas or systems should be obtained in advance before the first land and construction costs for a concentrated animal facility are spent. These commitments may be in the form of land leases with renewal options or cooperative contracts between feedlot or dairy operators and feed growers, which would be in the best interest of both parties.

The successes of odor control efforts utilizing chemical deodorizers and odor masking agents have, in most cases, been questionable. The best odor controls are, at present, the practice of good housekeeping, coupled with proper pen design and the careful selection of the feeding site. Regular manure removal and disposal, and short runoff-retention times can significantly reduce the amount of odor produced. A minimum pen slope of two percent enhances adequate drainage, and reduces sloppy pen conditions and resulting odors.

Odor problems could be largely avoided by provision of adequate separation distances between odor sources and points where the odor could unreasonably offend others, and thus constitute a nuisance. An adequate buffer zone for odor dissipation should be provided in all directions from the odor source, not just in the direction of the prevailing winds. Such a buffer zone could approximate the configuration of an egg, with the facility and all odor producing processes centered near the small end. The actual orientation of the area is dependent upon the integrated directions and velocities of the prevailing winds. The size of the buffer zone is dependent upon the size of the animal operation and type of manure management employed. Prevailing wind direction and velocity are important factors to consider in any location when predicting possible sources of odor complaints.

Pollution caused by wastes from animal concentrations can be as detrimental to the environment as wastes from any other industry. Many animal production facilities have been developed with little planning or concern for the nuisance and pollution characteristics inherent in such facilities.

Soil types, and underlying geologic structure of a potential animal concentration site, should be examined to ensure maximum protection from groundwater pollution. Highly permeable loose soils, shallow soils over fractured bedrock, and shallow water tables should be avoided in pen areas, runoff and solid manure storage pits, and field disposal sites receiving high runoff and manure application rates. Present trends in some states are directed toward regulating the amount of infiltration or percolation from pen surfaces and liquid waste impounding structures (California is one). (An example is the maximum of 0.1 acre foot per acre per year which was recently proposed by a south central state.) Sites selected on heavy soils (fine-particled, expanding or tight soils) with low infiltration or seepage rates are, in most cases, ideal for construction of waste retention and storage structures. In areas with fluctuating shallow water tables, concrete manure pits and confinement buildings designed with solid bottoms may shift from their original position and suffer damage, ultimately resulting in contamination of the aquifer underlying the area.

Plant species differ greatly in the amount of feedlot or dairy runoff or liquid waste which they can tolerate. Bermuda grass is the most tolerant, then grain sorghum, small seeded winter annuals; cotton is intolerant, and soybeans are very intolerant. The germinating and tender seedling stages of field crops are most susceptible to damage. (Seven biweekly applications of two surface inches of runoff from a dirt surfaced feedlot increased bermuda grass growth by 17 percent, decreased grain sorghum growth by 60 percent and decreased wheat growth by 72 percent. A similar treatment with concrete surface feedlot runoff decreased bermuda grass by 70 percent, grain sorghum by 88 percent and wheat growth by 99 plus percent. Soluble salts in the top 30 inches increased 3,321 pounds per acre, sodium increased 805 pounds per acre, and nitrate-nitrogen increased somewhat, but was highly variable depending upon crop growth and time of sampling.)[8]

Storm water runoff collection and retention structures are designed to retain and provide temporary storage for all storm water runoff which comes in contact with manure and other pollutants. It is important that proper capacity be provided so that large storms will not overflow and cause worse problems because of concentrated wastes which have been accumulating. Such runoff basins, as well as other lagoons for wastes in connection with large animal concentrations can also provide excellent breeding grounds for mosquitoes if proper controls are not exercised.

Economics

The increase in confinement feeding of animals has been spurred by a decreasing profit margin per animal. The economics of pollution and nuisance control are an important factor in the design and operation of confinement units,* and may mean the difference between financial success and failure for the owner. The trend toward completely housed animals has several advantages: 10 to 12 percent increased efficiency of feeding since animals are not working against muddy and other adverse environmental factors; slotted floors and manure scrapers eliminate the need for much labor involved in keeping pens clean; automated feeding systems help to further reduce labor and feed handling costs; benefits such as odor control, improved animal health, and simplified requirements for monitoring and maintaining nutritional quality control are also evident. The increasingly stringent legal requirements to control pollution and to have zero-discharge (no pollution) to waterways add further advantages to effects brought about by enclosed housing.

*Individual stalls are being used more and more, under the general title of "free stall loafing." Under this system, individual stalls, protected from weather, with dry bedding which will allow moisture to drain through, are provided so that each cow may have its own stall.[17] Bedding, because it is confined by curbing, is used more efficiently, cows are more protected from injury through being stepped on or otherwise bruised by other cows, less washing is necessary to keep cows clean, and the area required per cow is less than in a conventional loafing shed. Because of the limited amount of wash water necessary, disposal problems of manure and other wastes are greatly reduced, and a greater number of animals per acre can be adequately maintained. Labor costs are reduced also. (Good daily maintenance is very important to the success of this operation, as well as a good method of handling manure.)

Studies on commercial feedlot operations indicated that feedlots of 2,000 head or larger, operating at or near capacity, may enjoy critically significant cost advantages over smaller volume operations. Hauling and spreading of animal wastes is the lowest net cost when cropland is available and the manure is used to replace commercial fertilizers. The combination of lagooning, hauling, and spreading is the second lowest net cost--total lagooning is the highest, since no nutrients are recovered, and no "credit" obtained. However, liquid handling of manure, followed by land disposal has been accepted by confinement feeders because of the flexibility of the method, and because of the ability to recover nutrients in the wastes.

The value of different manure ingredients as fertilizing agents has been proven. In a dehydration plant, aside from a minor reduction in the nitrogen content, all ingredients from the solid and liquid excreta are transferred into the dried humus material which is the end product. Since the value of manure lies not only in its mineral content, but also, more importantly, in its organic content, the dried product is called humus. (See table below.) It has been proven to be very satisfactory as a soil additive and is used by both gardeners and florists.

Composition (in percent) of the humus manure[18]

	Organic Matter	Inorganics (N,P,K,Ca.)	Moisture
Laying Hens	65	18	15
Cattle	72	13	15
Swine	70	15	15

Sales of humus manures show it to be too expensive for mass agricultural production, but it can be sold to home gardeners with profit. It improves the quality of neutral alkaline soils, although it should not be spread on sour soils. (If a storage and land disposal system is used, there is an underlying assumption that the land will be used for both animal waste disposal and for growing crops.)

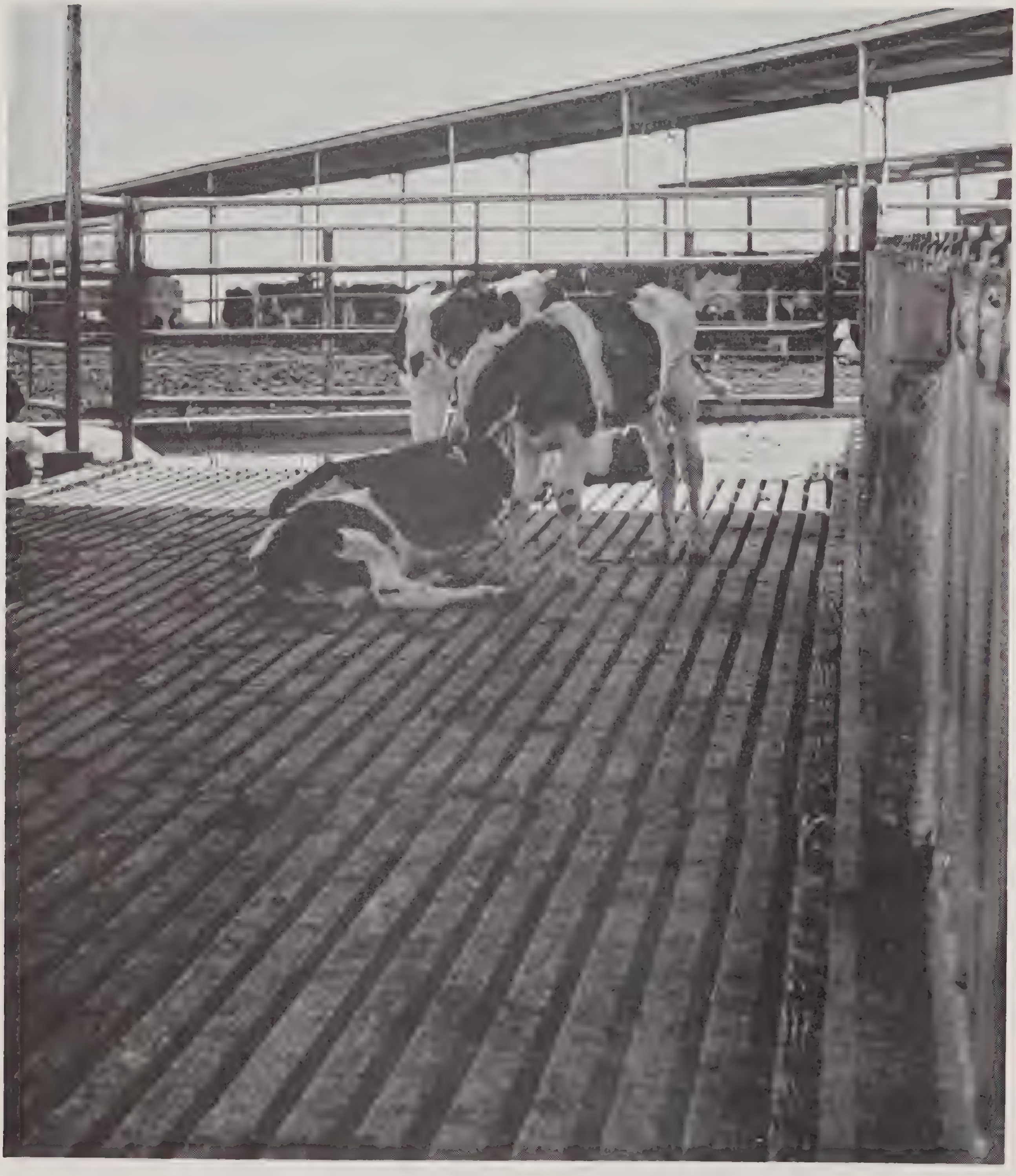
Treatment of animal wastes by conventional sewage treatment plants such as those used by municipalities is not reasonably feasible at present. Cost is prohibitive and the volume of dilution water required is not usually available. Nor would conventional secondary treatment remove sufficient nutrients from animal wastes to prevent serious degradation of receiving waters. (Large amounts of the solids present in animal wastes are non-biodegradable organics and salts whose presence in the treatment system effectively impedes transfer processes within the biological reactor. In hog wastes, for example, this represents about 60 to 70 percent of the solids.[10])

Clean pigs result from present modern devices. Present day swine raising practices allow maximum cleanliness. In this picture the waste falls through the slotted floors. It is kicked by the pigs and falls through the slots, so that there is virtually no detritus on the floors.

The material falls into flowing water under the concrete slats and is carried to a waste water processing area. The water transport is similar to Roman sewers. Anaerobic and subsequent aerobic ponds restore the water for reuse in the flushing system.

An interesting point is that the spacing of the slats increases as the pig size increases in subsequent pens. This relates to the size of feces particles as well as the size of the pig's feet. The larger animals are in the pens where the larger animals are kept. The larger feet do not become caught in the larger slots, however, the larger feces particles do fall through.

Roy Sharp Hog Ranch
5/16/74



"Automation" is continually sought by modern, efficient operators. Here in this calf holding area, slotted floors permit the manure to drop through into catch basins underneath the floor. When appropriate, sluice gates are opened, and water is flushed through the holding areas below, until all solids are carried out into a pumping pit, and thence conveyed into sewage lagoons for final separation with anaerobic-aerobic action. The first cost of such facilities is offset by increased manpower efficiency and animal health.

Henry Koetsier Dairy
5/9/74

One significant, relatively recent, labor-saving development in animal waste management is the hydraulic handling and transport of animal manures in confined livestock operations.[10] As presently designed for hog and beef cattle production operations, hydraulic transport facilities range from modest water-filled pits and oxidation ditches under slotted floors, to fairly sophisticated automated flushing devices of a variety of designs. However, a manure irrigation system for pumping a slurry, or wastewater, for field application costs about one-half as much as mechanically hauling and spreading a slurry within one-half mile of the feeding facility.[5]

Animal wastes contain considerable energy and nutritive value. Beef animals and sheep can utilize broiler litter and chicken manure as a part of their feed without affecting the taste of meat or rate of gain; sheep and steers readily consume a combination of cattle feedlot manure and hay. Pullets and laying hens, as well as catfish, will make rapid gains on feedlot manure; however, when fed to fish, care must be taken to prevent oxygen depletion in the fish pond.[20]

Livestock feedlot runoff offers potential as a resource to be used for crop production, but must not be applied in large amounts to soil immediately before planting of tender seedlings. It can be applied to established crops if care is taken as to amounts, source, and crop species.

Solving pollution problems in connection with various types of land use involves economic trade-offs. At first glance, it appears that the land user is being given added costs which result in lowering the profits of his operation, and in many instances, this is so. However, on examination of *long-term* considerations, these costs often become equalized as a result of added efficiencies of operation. In addition, land-uses could be continued, which might have been forced to move after destruction of the utility of the land and its region when natural resources were depleted or altered. In the case of concentrated animal and poultry operations, if attention is not given to pollution problems, water supplies and soil resources could become so degraded that such operations would feel it desirable to move to a new location, or costs of treating water could become relatively too high. In the case of dust and odor pollution, pressures from surrounding land owners could become prohibitive, and force expensive relocation.

New Federal, State, and local regulations designed to protect natural and human environments have forced the building of modern handling facilities for animals and poultry, and the wastes involved. However, they have also resulted in reduced labor costs, reduced water costs (where certain types of operations use recycled water) and reduced bedding costs when bedding materials have been reclaimed from waste materials. When land disposal is utilized, benefits to soils in terms of humus and nitrogen have been noticeable, especially when application rates have been carefully monitored to avoid nitrogen build-up in the soil and underground water supplies. Specialized cropping patterns have also proven useful in making full utilization of the manures spread on land.

Other benefits to be realized from modern enclosed facilities include total control of animal wastes, smaller space requirements per animal, improved efficiency of feed conversion and efficiency of delivery of feed to animals, as well as elimination of air pollution in the form of dust and odor. (For example, if a 10 percent savings on feed cost could be realized, it is estimated that the increased investment cost could be paid off in about four years.[18])

A relatively new proposal for utilization of animal wastes has been discussed which involves the production of methane gas and carbon dioxide as by-products of the biological treatment of such wastes. The gases can be collected and used for heating, and running of various machinery and engines. Fuels and other energy needs such as lighting can also be supplied. (A device of this type has been demonstrated at an animal-raising facility in Australia, and is patented in the U. S.) It is of sufficient merit to warrant full scale pilot model construction here to establish its feasibility for local dairymen. Such a system could provide the economic benefits to pay for pollution control costs in handling wastes, as well as providing a new source of fuel in an era of fuel shortages.[31]

The conversion of methane gas thus produced to methanol (methyl-fuel) would provide a valuable motor-fuel for mobile or vehicle use. Methane is easily converted to methanol by means of a pressurized, heated system with a catalyst. Up to fifteen percent methyl-fuel can be burned with gasoline without engine modifications and 100% methanol can be used by carburetor modification to change the air-fuel ratio to 6:1 rather than the normal 14:1.

Increased cost of production as well as increasing demands for protein and other nutritional sources have caused dairy farmers to seek greater concentrations of animals, as well as breeding up for increased production per animal. In 1970, U.S. dairy herds averaged 9400 pounds of milk per cow compared with only 5800 pounds in 1955, a 61 percent increase. With per capita consumption of dairy products holding steadily as measured by product weight, total milk consumption will move upward as population increases. By the year 2000, American dairy farmers will need to supply 157.5 billion pounds of whole milk to meet consumer demands, 35 percent more than current production. This herd, in clean surroundings, with concentrated food sources, illustrates good examples of the modern animal in modern facilities.

Santos Dairy
5/9/74

Chapter III

Recommendations

CHAPTER III

RECOMMENDATIONS

Current Controls (General)

The basic policy and philosophy of water pollution control in this country can be found in the Water Pollution Control Act of 1948, and amendments in 1956, 1961, 1965, and 1966. This includes the following:

> "Congress has the authority to exercise control of pollution in the waterways of the nation; both health and welfare are benefited by the prevention and control of water pollution; Congress has no intention of divesting either the states or the Federal government of authority to prevent or control water pollution; a national policy for the prevention, control and abatement of water pollution shall be established."

The "Rivers and Harbors Act of 1899," provided for a permit system to control industrial pollution discharges to navigable streams and waterways and stream and pipe discharges thereto. By Executive Order No. 11574, of the Federal Government, in 1973, this Federal program governing industrial waste discharge permits was enlarged to include discharges from large animal and poultry operations. The permit program is most significant in that it establishes the basis for obtaining detailed data on waste discharges from feedlots and large dairies, and the prescription of effluent quality discharge guidelines, or effluent standards.

On the local governmental level, there is a clear intent and responsibility for local health and zoning authorities to regulate and abate anything in confined feeding operations which may constitute a menace to public health or welfare.

The Water Pollution Control Act covers all forms of pollution, irrespective of its source. Certain types of pollution have been classified as "natural" or "background" pollution. "Natural" pollution can come from a number of sources such as runoff from urban, rural and forest lands, natural chloride seeps, decaying vegetation such as leaves and crop residue, and animals on pasture and grazing land. Such pollution is difficult to control because of its diverse nature, lack of controllable point sources, and inadequate knowledge concerning feasible collection and treatment techniques. Recently, however, the traditional concept of including pollution from animal wastes as "background" or uncontrollable pollution has been questioned and termed unacceptable.[20] Farmers and ranchers should recognize that drainage from feedlots, farmsteads and fields is clearly pollutional if such drainage contributes material objectionable to the water use of others.

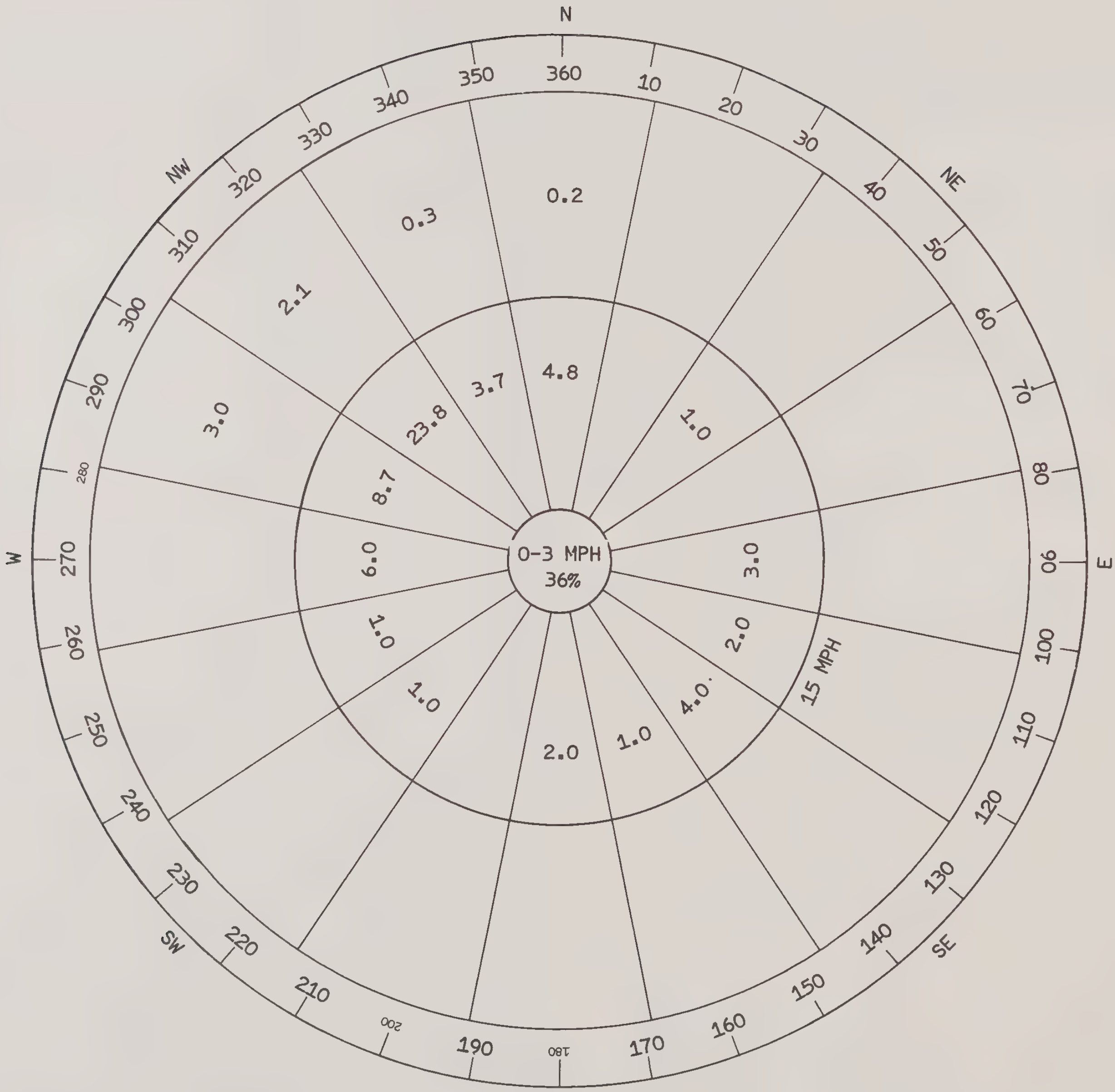
States have placed restrictions on the minimum distance that a feedlot or large dairy can be located from surface water, residential dwellings, municipalities, recreation areas, and arterial highways. They have required such improvements as storm water runoff control facilities, structures for prevention of groundwater contamination, storage for solid and runoff carried wastes, and specified ultimate disposal procedures.[2] Often such regulations are very general and local governments have tailored them to suit local conditions. Local Governments have generally agreed with the Federal conclusions that wastes from animal production facilities should not be classified as "uncontrollable" or "natural" and have recommended that large scale animal production facilities be considered as individual industries and be considered subject to State, Federal, and local regulations concerning pollution abatement. Those regulations have been held to review to ensure that they adequately cover pollution caused by animal production facilities.

Controls (Specific)

The selection of a site should consider the microclimate extremes in wind, solar radiation, and precipitation, as well as distance from residential areas and public gathering places, and the attitude of immediate neighbors.[5] Wind can be controlled to some extent with natural land forms or vegetative shelter belts. Zoning can be useful to prevent the encroachment of residential, shopping, and recreational areas into nearby lands adjacent to large animal operations, and thereby reduce conflicts in land uses.

The soil properties which influence the development or lack of development of denitrification include: drainage, porosity and permeability, texture, structure, surface slope, nature, amount, and location of organic matter within the soil.[22] Therefore soil types become extremely important as a factor in location of large animal concentrations where on-site waste disposal is proposed. Some other pollution hazards which should be avoided or controlled include: location of feedlots or dairies on lakes or streams; outside runoff entering confined feeding operation; high degree of slope which can cause accelerated runoff; poor management of storage of manure, either in design or use; high density of animals; and storage areas not designed to restrict seepage, percolation or other movement of animal manure into groundwaters.[5]

WIND ROSE



99.2% WIND COVERAGE

CALMS 0-3MPH 36%

SOURCE: UNITED STATES WEATHER BUREAU FRESNO-CHANDLER AIRPORT NINE YEAR RECORDING PERIOD

Prepared By Tulare County Planning Department 1973

The Wind Rose illustrates the percentage of time during which prevailing winds come from a certain direction. For example, this Wind Rose shows that the wind comes from the northwest at 3 to 15 miles per hour, 51 percent of the time and at over 15 miles per hour, 5.6 percent of the time. This is important in helping to establish Windshed Areas and showing advantages in disbursing dairies enough so that they do not conflict with each other, and with other uses in the agricultural area, including residences.

Chapter IV

Policies

CHAPTER IV

POLICIES

The Planning Department staff should be directed by Board and Planning Commission orders and a Zoning Ordinance amendment, if necessary, to approve Special Use Permits for dairies and feedlot operations after consideration of location, operation, site design, environmental impact, numbers of animals, possible pollution hazards, and relationships to the General Plan Elements of Tulare County. The Planning staff should see that the final criteria are met in approved plans before staff level approval of Special Use Permits for new dairies or feedlots can be granted:

1. The minimum lot size, 80 acres.

2. The closest proximity of constructed buildings of the dairy, swine, fowl or animal raising facility to other dwellings or facility buildings (excluding feed and hay storage, parking, garages, or dwellings of on-site workers or family of the owner) on adjoining lands or to the buildings associated with swine raising or feedlot operations -- 1,320 feet.

3. The maximum density of "wet stock" animals on a dairy should not exceed six animal units per acre, while the addition of a new dairy should not cause the maximum density of "wet stock" dairy animals in dairies lying within a one mile radius of the proposed new dairy to exceed four animal units per acre, unless adequate technological systems or facilities are provided to prevent the unacceptable nitrification or salt pollution of soils, or the pollution of groundwater by nitrates and salts emanating from this facility.

4. The addition of a new dairy, swine, or poultry operation should not cause the maximum density of "dry stock" animals in animal or fowl raising facilities lying within a one mile radius to exceed four animal units per acre, unless adequate technological facilities are provided to prevent the unacceptable nitrification or salt pollution of soils, or the pollution of groundwater by nitrates and salts emanating from this facility.

5. A new dairy, feedlot, swine or poultry raising structure or area of animal or poultry concentration shall not lie within a Windshed Area as defined on the Open Space Map of the Environmental Resources Management Element for Conservation, Open Space, and Recreation Elements of Tulare County, nor within the shorelands,* nor within primary floodplains,** nor within 1,000 feet of the boundary of a public park, in sink holes or areas draining into sink holes, or within one-half mile of the nearest point of a dwelling structure in a concentration of 10 or more private residences (at the time of issuance of permit).

6. The new dairy or feedlot, swine, or poultry raising operation, should not have its main structures less than the distance shown on the accompanying Micro (local area) Windshed Diagram (attached Diagram A) to an occupied dwelling owned by a property owner other than the dairy feedlot, swine or poultry site owner/operator, nor shall it be less than one-half mile upwind or one-quarter mile downwind from an established citrus, vineyard, deciduous fruit, or vegetable agricultural enterprise.

These are basic criteria establishing the basis for staff level approval of Special Use Permits related to dairies, feedlots, swine raising or poultry raising operations. Such basic criteria, and conditions which illustrate the ability of the operation to meet the conditions listed below, should be established through the submission of the following evidence: A map or aerial photograph of the area showing homes, buildings, lakes, ponds, water courses, wetlands, dry runs, rock outcroppings, roads and applicable details. Such a map should indicate the general topography with contours and drainage patterns. The well(s) or water source(s) should be indicated (with depth to water table at the highest known depths), as well as a north arrow, and a locational (inset) map showing the property parcel ownership within one mile, with general types of agricultural or urban uses on such properties. A description of general geological conditions, and soil types should be attached. A plan should also indicate operational procedures, the locations and specifications of proposed animal waste treatment works, land areas to be used for disposal of animal wastes, and the quantity and type of effluent to be discharged from the site.

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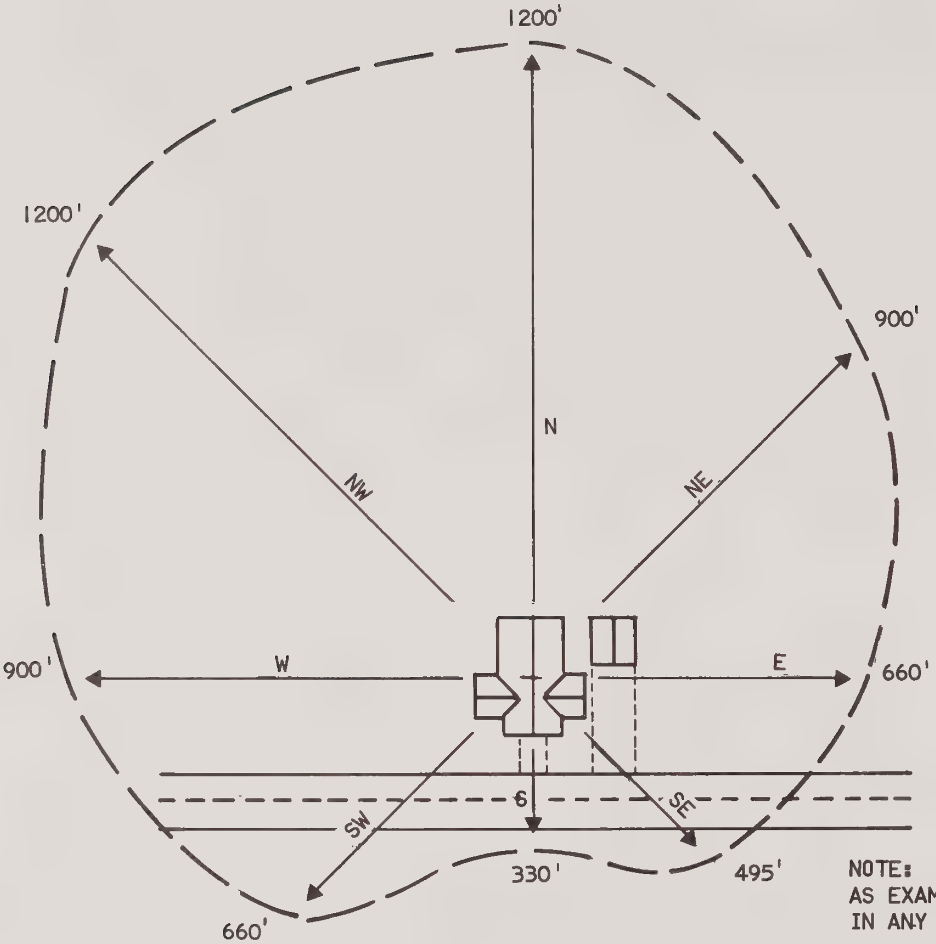
*Land within 300 feet of a river or stream or the landward side of a floodplain, delineated by ordinance, on such a river or stream, whichever is greater.

**Land within 1,000 feet of the normal high-water mark of a lake, pond, or flowage.

MICRO-WINDSHED DIAGRAM



Conflicts can develop between the dairyman or feedlot operator and his neighbor if there is not a proper buffering distance between such uses. Direction and velocity of the prevailing winds are important factors in establishing distances for such buffering areas. The diagram indicates that there should be 1200 feet between intense animal concentrations and residences downwind. If the residence is located "upwind" from an animal facility, it may be situated much nearer; up to a minimum 330 feet. This kind of precaution will lessen conflict between neighboring land users and encourage the location and retention of large animal raising facilities in the agricultural industry and economy of Tulare County.

This diagram is used as an advisory standard by the Planning Department Staff and the Commission in reports and recommendations related to Special Use Permits and Building Permits for new and enlarged dairies, feedlots, and other animal raising operations needing these operations. It is recommended that it be applied to all new residential locations - relative to existing animal facilities - to avoid land use conflicts.

Conditions to be Attached to all Staff Level Dairy Use Permits:

1. The facility shall be developed and maintained in accordance with the plans and specifications submitted with the application and the standards contained therein.

2. Sufficient parking area shall be provided for all cars and trucks, and the parking area, work area and entrance road shall be treated with road oil or other acceptable dust retarding treatment so that dust and mud will not create conditions detrimental to the surrounding area and roads.

3. Dedication to the County of Tulare of all property lying within ______ feet of the centerline of the right-of-way of Avenue ______ (Road) ______ necessary to bring all adjacent road rights-of-ways up to current County standards.

4. The proposed use shall meet the criteria of the "California State Water Resources Control Board Minimum Guidelines for Protection of Water Quality from Animal Wastes." (See appendix.)

5. The proposed use shall meet the Tulare County Water Well Standards for domestic and irrigation standards.

6. A fire truck pumper outlet shall be installed in a location specified by the County Fire Warden and be as a minimum a 4' x 2-1/2" Wharf hydrant with National Standard threads.

7. The proposed sump pit(s) shall be large enough to hold 120 days accumulation of waste water.

8. The proposed sump pits shall comply with all standards and requirements set forth by the encompassing Mosquito Abatement District for a use of this type. (Dairy drain liquid manure is frequently a major breeding source for the house mosquito.)

9. The waste pond shall be restricted to a depth to maintain at least a 10' separation between the bottom of the pond and any water-bearing strata. Maximum slopes on the wet side of the levees around the pond should be 1:3 and on the dry side, 1:2. Aerated lagoons without mechanical aeration should be no more than three to four feet deep; with mechanical aeration, 15 to 20 feet deep.

10. The distribution of wet manures from the dairy or feedlot shall not exceed that amount yearly which will provide for more inorganic N than can be utilized by planted crops, on acreages either owned or leased by applicant (as evidenced by signed lease agreements), and thus prevent residual organic N from building up in the soil. (In most soils this will mean a limit of 10 yards per acre on silage and oats, and 5 yards per acre on improved pasture and other crop lands.)

11. The applicant shall demonstrate that liquid and solid manure will be handled in such a manner as to prevent a nuisance caused by any fly breeding, dust, or odors. Dust, odor and flies shall be kept to a minimum and shall not be allowed to become a nuisance to adjoining properties.

12. No portion of the property covered by this application shall be sold or used for purposes other than those expressly permitted under this Use Permit unless an amendment to the Use Permit is approved by the County. This shall not restrict the sale of the entire parcel of property as a unit.

13. All exterior lighting shall be so adjusted as to deflect direct rays away from public roadways and adjacent property.

14. The proposed facilities shall be constructed, maintained and operated in accordance with all State and County health regulations, and County zoning and building laws.

15. Any structure built shall conform to the building regulations and the building line setbacks of the Ordinance Code of Tulare County insofar as said regulations and setbacks are applicable to such structure.

16. The conditions set down shall be complied with commensurately or before the premises shall be used for the purpose applied for, in order that the safety and general welfare of the persons using said premises, and the traveling public, shall be protected.

17. The Use Permit shall automatically become null and void one year after the date on which it is granted, unless the applicant, or his successor, has actually commenced the use authorized by the permit within said one-year period.

18. The Use Permit will not be effective until the applicant, at his own expense, has executed and filed with the County Recorder a certified copy of this permit with a duly authorized acceptance, in a form approved by the County Counsel, endorsed thereon.

19. Topographic conditions for site suitability include: maximum slope of 2 to 6 percent within feed pens; an area used for manure storage having deep, tight soil over bedrock and a deep groundwater table which is located away from natural drainage channels; a dry feedlot or feeding pen access route which may be easily maintained for manure removal during all weather conditions; provision for a low gradient site for collection of runoff which is located away from natural drainage channels.

20. Ponds should be emptied at least every 4 to 6 months, to prevent salt build-up.

21. Areas should be screened or otherwise isolated from public view which might suggest that the production facility could be a source of odors, flies, or other cause of nuisance or materials which could cause environmental quality degradation.

22. The effluent from anaerobic lagoons should receive further treatment before direct discharge to water courses or should be disposed of by land spreading.

23. Land spreading should be governed by the following criteria: Uniform spreading of wastes; rate, time and frequency of application should be governed by maximum nutrient utilization by plants; disposal areas with low erosion potential should be selected; wastes should not be applied on grassed waterways or other drainage paths; wastes should be plowed under on barren fields.

With proper design, completely aerated lagoons, where bacteria have readily available oxygen to aid in conversion of organic wastes to more basic compounds, make odorless operation possible. With proper management, oxygen demanding materials and solids can be removed or oxidized to the degree that recycling to the land can be accomplished with a minimal pollution hazard. The general trend in dairy cow management within the last fifteen years has been toward self-contained waste disposal systems, using liquid or slurry wastes for fertilizer and recycled waste water for flushing systems for cleaning animal shelters.

Henry Koetsier
5/9/74

Chapter V

Appendix

CALIFORNIA STATE WATER RESOURCES CONTROL BOARD

MINIMUM GUIDELINES FOR PROTECTION OF WATER QUALITY FROM ANIMAL WASTES

The State Water Resources Control Board has issued these guidelines for the assistance of regional water quality control boards and all other persons in the preparation and amendment of water quality control plans and waste discharge requirements for the protection of the quality of the waters of the State with respect to the disposal of animal wastes.

It is intended that, when justified, regional boards may be more restrictive than these guidelines.

The disposal of animal wastes can cause problems other than water quality degradation. To whatever extent it is appropriate, solutions to such problems will need to be integrated with these guidelines. Other agencies may have guidelines directed to points not addressed in the guidelines below.

ARTICLE I: DEFINITIONS

Animal Confinement - Cattle, calves, sheep, swine, horses, mules, goats, fowl or other domestic animals corraled, penned, tethered or otherwise caused to remain in restricted areas where feeding is other than by grazing.

Manure Storage Areas - Corrals, feedyards, retention ponds, manure collection areas of any kind and areas used for storage, composting and/or drying of animal wastes.

Ten-year 24-hour Storm - A storm of 24-hour duration which yields a total precipitation of a magnitude that has a probability of recurring only once every ten years.

Washwater - Water which has been used for washing animals or equipment or for cleaning manure storage areas.

Retention Pond - Pond used to retain washwater or surface drainage from manure storage areas until proper disposal on land or other suitable disposal means can be accomplished.

Twenty-year Peak Stream Flow - Stream flow magnitude that is expected to be equaled or exceeded on the average of once every 20 years.

One Hundred-year Peak Stream Flow - Stream flow magnitude that is expected to be equaled or exceeded on the average of once every 100 years.

Sandy Loam - Soil material in which the sandy characteristics are readily recognizable. A typical sandy loam will contain from 43% to 85% sand, less than 20% clay and a content of silt plus twice the clay exceeding 30%. The normal soil textural triangle utilizing the content of sand, silt and clay to determine texture will provide the standard definition of a sandy loam.

ARTICLE II: GUIDELINES FOR PROTECTION OF SURFACE WATER

1. Animal confinement facilities plus adjacent crop lands under the control of the operator shall have the capacity to retain surface drainage from manure storage areas plus any washwater during a 10-year 24-hour storm. The regional board may set waste discharge requirements for discharges exceeding a 10-year 24-hour storm.

2. Surface drainage, including water from roofed areas, shall be prevented from running through manure storage areas.

3. Animal confinement facilities, including retention ponds, shall be protected from overflow from stream channels during 20-year peak stream flows for existing facilities and 100-year peak stream flows for new facilities.

4. Washwater and surface drainage from manure storage areas shall be applied to crop lands, or discharged to treatment systems subject to approval by the appropriate regional water quality control board.

5. Animals in confinement shall be prevented from entering surface waters.

6. Lands that have received animal wastes shall be managed to minimize erosion and runoff. Dry manures applied to cultivated crop lands should be incorporated into the soil soon after application.

7. Animal wastes shall be managed to prevent nuisances in manure storage areas.

ARTICLE III: GUIDELINES FOR PROTECTION OF GROUNDWATER

1. Manure storage areas shall be managed to minimize percolation of water into underlying soils.

2. Animal confinement facilities shall have adequate surface drainage to prevent continuous accumulation of surface waters in corrals and feedyards.

3. The use of special sealants for retention ponds is not usually necessary when these ponds are constructed on sandy loams or finer textured soil materials.

4. Application of manures and washwaters to crop lands shall be at rates which are reasonable for the crop, soil, climate, special local situations, management system and type of manure.

5. The salt in animal rations should be limited to that required to maintain animal health and optimum production.

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Berkeley, California
August 1967

SOIL LIMITATION RATINGS FOR SEWAGE LAGOONS

Definition and Scope:

Sewage Lagoons are shallow lakes used to hold sewage for the time required for bacterial decomposition. Sewage lagoons require consideration of soil for two functions: (A) as a floor for the impoundment area, and (B) as a source of embankment material. The requirements for the embankment are the same as for other embankments designed to impound water. There must be adequate soil material available that is suitable for the structure and, when properly constructed, the lagoon must be capable of holding water with minimum seepage.

Soils are grouped into three degrees of limitations: slight, moderate, and severe.

Assumptions:

Depth of liquid - 2 to 5 feet.

Impervious soils of basin - at least 1 foot thickness.

Criteria:

A. Soil as a Floor for Impoundment Area

Soil Property or Quality	Class Definition and Degree of Limitation for Lagoon Basin Floors		
	Slight	Moderate	Severe
Permeability (in./hr.)	Less than 0.63	0.63-2.0	More than 2.0
Depth to hard rock (ft.)	More than 5	3-5	Less than 3
Slope and relief (%)	Less than 2	2-9	More than 9
Organic matter (%)	Less than 2	2-15	More than 15
Coarse fragments: less than 10" dia. (% by volume)	Less than 20	20-50	More than 50
More than 10" dia. (% of surface area)	Less than 3	3-15	More than 15
Soil texture (Unified Classification)	GC, SC, CL, CH	GM, ML, MH SM (20-50% fines*)	SM (less than 20% fines*), GW, GP, SW, SP, OL, OH, Pt
Soil texture (USDA) and predominant clay material	c (mixed or mont.), sic, gc, sicl, cl, scl, sil (more than 18% clay), 1	c (kaolinitic), sil (less than 18% clay), vfsl, sl, gravelly silty material	Gravels and sands, organic (15-30% O.M.), silts and clays, peat and mucks

* "fines" - less than .074 mm. (200 mesh)

SOIL CONSERVATION SERVICE
ENGINEERING STANDARD

DISPOSAL LAGOON

Definition

An impoundment made by constructing an excavated pit, dam, embankment, dike, levee or combination of these for biological treatment of organic waste. (This standard does not include holding ponds and tanks.)

Scope

This standard establishes the minimum acceptable quality for design construction, and maintenance of disposal lagoons located to serve predominantly rural or agricultural areas.

Purpose

Lagoons are constructed to biologically decompose organic waste by aerobic or anaerobic organisms.

Conditions Where Practice Applies

General

This practice applies where there is need for a facility to process concentrated organic waste, reduce sources of pollution, minimize health hazards and improve the local environment.

State Law

All state and local laws, rules and regulations governing use of disposal lagoons shall be strictly adhered to. The owner or operator must be responsible for securing necessary permits where required.

Design Criteria

Types

Disposal lagoons are of three types depending on the reaction that takes place--anaerobic, aerobic or a combination of both. Anaerobic lagoons are septic and will give off odors. Most structures for treatment of animal wastes are of this type due to the volume of material to be handled. Aerobic lagoons, when properly designed and managed, are relatively odor free, but require greater surface area per animal unit and may require aerating facilities at certain periods of the year.

Location

The site shall be located adjacent to or near the source of waste. It shall be as far from inhabited dwellings as practical with a minimum distance of 300 feet. Locate where summer prevailing winds will carry odors away from the house and public areas.

The lagoon shall be located and constructed so that uncontrolled runoff from outside drainage areas does not enter the lagoon.

Soil and Foundation

Locate on soils of low permeability or soils suitable for sealing. Prevent contamination of underground water table by avoiding soils with high water table, sandy or gravelly soils, or shallow soils, over-fractured or cavernous rock.

Water Supply

Sufficient water supply shall be available to fill the lagoon before loading and to maintain it after operation starts.

Temperature

The temperature of lagoon waters affects the rate of biological activity. There is essentially no activity in anaerobic lagoons with water temperatures below 45° F. They operate best at temperatures of 70° - 130° F. Ice and snow cover on aerobic lagoons reduces sunlight penetration and associated algae growth necessary for providing oxygen. Under such conditions there is limited biological activity in such lagoons. Loading rates should be less and detention times greater in colder climates than in warmer climates.

Composition of Wastes

Table 1. Composition of Livestock and Poultry Wastes, lists daily production of manure, BOD_5 and volatile solids per animal. This table may be used as a guide to lagoon design, but local or on-site determinations should be utilized where possible. Production of manure, BOD_5 and volatile solids varies considerably depending on feed, climate, size of animal and production methods. The maximum weight of animals which may utilize a lagoon at any one time should be the basis for estimating waste production.

Aerobic Lagoon Loadings

Aerobic lagoons are designed on the basis of daily BOD_5 loading per acre of surface area. Figure 1 shows loadings generally recommended by states[1]. Allowable loadings for aerobic disposal lagoons shall be in accordance with state requirements.

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[1]Canter, L. W. and A.J. Englande, Jr., October 1970. Journal, Water Pollution Control Federation

Criteria (Continued):

B. Soil as a Source of Embankment Material			
Soil Property or Quality	Class Definition and Degree of Limitation		
	Slight	Moderate	Severe
Soil texture (Unified Classification)	GC, SC, SM (20-50% fines*)	GM, CL, CH, ML, MH, SM (less than 20% fines*)	GW, GP, SW, SP, OL, OH, Pt
Soil texture (USDA)	gc, cl, scl	c, sic, sicl, sil, vfsl, l, sl	gravels and sands, organic (15-30% O.M.), silts and clays, peat and mucks

* "fines" - less than .074 mm. (200 mesh)

References:

(1) United States Department of Housing and Urban Development. 1960. Community sewage systems, "Design Guides For Sewage Stabilization Basins." Fed. Housing Adm. Series No. 1833.

SOIL CONSERVATION SERVICE
CALIFORNIA SUPPLEMENT
ENGINEERING STANDARD

Disposal Lagoon

Lining

Manure is considered an adequate sealant in soils of sandy loam texture or finer.

Lagoons built in or with soils coarser than sandy loam require lining. Adequate lining may be 6 inches of compacted soil of sandy loam texture or finer or other acceptable pond sealing or lining material; see Code 521.

Moist soil of sandy loam or finer texture compacted to a 6 inch thickness with three passes of sheepsfoot equipment or 90% of the area covered by a loaded carryall is considered a suitable lining.

SOIL CONSERVATION SERVICE
CALIFORNIA SUPPLEMENT
ENGINEERING STANDARD

Disposal Lagoon

Anaerobic Lagoon Loadings

Anaerobic lagoons are designed on the basis of daily BOD_5 or volatile solids per 1000 cubic feet of lagoon volume. Figure 2 shows loadings generally recommended by zones of the country. Allowable loadings for anaerobic disposal lagoons shall be in accordance with state requirements. The volume of an anaerobic lagoon for swine waste is to be based on 1 cubic foot of volume per pound of animal weight. An acceptable average is 150 cubic feet/animal.

Earth Embankment

Top Width - The minimum top width shall be 8 feet.

Side Slopes

The combined side slopes of the settled embankment shall not be less than 5 horizontal to 1 vertical.

Freeboard

The minimum elevation of the top of the settled embankment shall be 1 foot above the water surface in the lagoon.

Allowance for Settlement

The design height of the embankment shall be increased by the amount needed to insure that the design top elevation will be maintained after settlement has taken place. This increase shall not be less than 5 percent.

Depth

The minimum depth of liquid storage space shall be 6 feet for anaerobic lagoons and 2 feet for aerobic lagoons. Maximum depths for anaerobic lagoons are those dictated by the site and needs. Maximum depth for aerobic lagoons shall be 5.0 feet.

Bottom

The bottom of aerobic lagoons shall be approximately level to prevent formation of septic pockets.

Edges

The edges of the lagoon below the planned water line shall be deepened to a stable slope as steep as soil conditions will permit to reduce areas of shallow water and to inhibit weed growth.

Inlet

Where freezing is not a problem, an open inlet consisting of a concrete ditch may be used. Where freezing is a problem, the inlet shall consist of a pipe with a minimum diameter of 6 inches with a minimum slope of 1 percent. The inlet pipe should terminate near the center of the lagoon and far enough below the surface to protect from freezing or other protective measures provided. Access to the pipe for rodding should be provided in case of blockage.

Outlet
An overflow pipe shall be installed so that water is discharged from a minimum of 6 inches below the surface when the maximum water level is reached. A vented elbow or turndown on the outlet pipe entrance may be used for this purpose.

Effluent Disposal
The effluent from lagoons should be retained on farm or ranch property. It may be further treated by additional lagoons or held in holding ponds prior to final disposal. Final disposal may be by evaporation or by liquid spreading systems, irrigation systems or other land application measures. The disposal area should have proper soils and cover to prevent pollution of groundwater. Application rates should be sufficiently low to prevent surface runoff and volume of effluent applied should be such that nutrients are utilized by the plant cover. Lagoon effluent shall not be allowed to discharge to surface waters unless the owner determines through the state water pollution control agency that such discharge will not be in violation of established water quality standards.

Settling Tank
A settling tank may be provided between the lagoon and waste source to trap solids which will not completely decompose. This may be a concrete tank which can be emptied periodically or excavated areas which can be cleaned periodically with a front-end loader. Where excavated areas are used, a minimum of two will be required so that one may be dried and cleaned while the other is functioning. A minimum of 7 to 10 days storage should be provided in the settlement tank based on a minimum requirement of 6 gallons per day per horse or cow and 1 gallon per day per sheep or hog.

Protection
Where the location is such as to create a safety hazard the lagoon should be fenced and warning signs posted to prevent children and others from using the lagoon for purposes other than intended.

Vegetation
The embankment and surrounding areas shall be vegetated to protect from erosion.

Operation and Maintenance
Loading - The lagoon should be filled with water to the minimum depth. The first loading in summer shall be gradual. If the first loading is made in the winter, loading rate is not important as reaction will be slight before warmer weather occurs. Daily loading results in best operations. If intermittent loading is necessary, the minimum depth should be maintained by addition of water.

Floating Material - Provisions shall be made to keep bedding material, straw, oil and other floating material out of the lagoon. Grass clippings from mowing operations should be removed from the lagoon.

Plans and Specifications

Plans and specifications for installation of Disposal Lagoons shall be in keeping with this standard and shall describe the requirements for application of the practice to achieve its intended purpose.

LIVESTOCK AND POULTRY POPULATIONS PER SURFACE ACRE OF LAGOON

ANAEROBIC LAGOONS

ANIMAL	NUMBER BOD PER ANIMAL PER DAY[1]	ANIMALS PER 1000 CUBIC FEET		CUBIC FEET PER ANIMAL		ANIMALS PER SURFACE ACRE						AEROBIC LAGOONS
						ZONE A DEPTH (FEET)[6]			ZONE B DEPTH (FEET)[6]			ANIMALS PER ACRE[3]
		ZONE A[2]	ZONE B[2]	ZONE A	ZONE B	6	8	10	6	8	10	
Dairy Cattle	2	2	1.5	500	660	(83)[5] 470	(62) 630	(50) 780	(111) 350	(83) 470	(66) 590	17.5
Beef Cattle	1.5	2.7	2.0	370	500	(62) 630	(47) 850	(37) 1,050	(83) 470	(62) 630	(50) 780	23
Horses	1.4	2.9	2.1	345	480	(58) 675	(44) 910	(35) 1,140	(79) 500	(58) 675	(47) 890	25
Sheep	0.25	16.0	12.0	62	85	(10) 3,790	(7.5) 5,060	(6) 6,320	(14) 2,830	(10) 3,790	(8) 4,720	140
Hogs	0.32	6.3[4]	4.7[4]	160	215	(26) 1,470	(20) 1,970	(16) 2,470	(35) 1,110	(26) 1,470	(21) 1,850	109
Poultry	0.015	133[4]	100[4]	7.5	10	(1.2) 31,400	(0.9) 41,800	(0.75) 52,200	(1.6) 23,540	(1.2) 31,400	(1.0) 39,200	2,330

[1]Table I Code 359 NEH 2, 4/71
[2]Fig. 2 Code 359 NEH 2, 4/71
[3]Based on 35 #BOD per acre per day

[4]Half values of those in [2]
[5]Number in parenthesis is the square footage of surface area needed per animal for the given depth
[6]Assuming 2.1 side slopes

Daily Production and Composition of Animal Manure
(1) (2) (3) (4) (5) (6)

Animal	Manure	5-day BOD	COD	Total Solids	Volatile Solids	N	P	K
	(Production in lbs/day)							
1200-1400 lbs. Dairy Cattle	100	2.0	9.0	10	8	0.38	0.10	0.31
800-1000 lbs. Beef Cattle	75	1.5	7.0	10	7	0.52	0.15	0.34
100 lbs. Sheep	4.0	0.25	0.75	1.05	0.86	0.04	0.012	0.04
150 lbs. Hogs	8.5	0.32	0.70	1.0	0.6	0.07	0.04	0.06
4 lbs. Poultry	0.25	0.015	0.05	0.065	0.042	0.003	0.003	0.002
4 lbs. Broilers	0.25	0.015	0.05	0.065	0.042	0.003	0.003	0.002
1000 lbs. Horses	56	1.4			8	0.48	0.07	
People	3.9	0.17	0.44	0.55		0.033	0.03	

1. Davis, E.H., 1969. Animal Waste Data and Population Equivalents. E.M. 2592 - Cooperative Extension Service. Washington State University.

2. Jones, D.C., D.L. Day, and A.C. Dale. 1970. Aerobic Treatment of Livestock Wastes. Bulletin 737. University of Illinois.

3. Townsend, A.R., K.A. Reichert, and J.H. Nodwell. 1969. Status Report on Water Pollution Control Facilities for Farm Animal Wastes in the Province of Ontario. Cornell University Conference on Agricultural Waste Management.

4. Schmid, L.A. and R.I. Lipper. 1969. Swine Wastes, Characterization and Anaerobic Digestion. Cornell University Conference on Agricultural Waste Management.

5. Anderson, M.S., 1957. Farm Manure. The 1957 Yearbook of Agriculture.

6. Witzel, S.A., E. McCoy, L.B. Polkowski, O.J. Attoe, and M.S. Nichols. 1966. Physical, Chemical and Bacteriological Properties of Farm Wastes (Bovine Animals). National Symposium on Animal Waste Management.

Livestock and Poultry Inventory - 1971
50 States

Region and States	Cattle[1] Dairy[2]	Beef[2]	Total[1]	Sheep[1] and Lambs	Hogs[1] and Pigs	Chickens[1] and Turkeys	Broilers
	-----	-----	-----	1000 head	-----	-----	-----
NORTHEAST REGION							
Connecticut...........	108	11	119	4.8	9.5	4954	932
Rhode Island..........	10	2	12	1.8	10	461	
Delaware..............	21	11	32	2.1	46	899	20574
Kentucky..............	594	2265	2859	88	1734	4156	
Maine.................	120	21	141	15	10	8459	11777
Maryland..............	265	165	430	20	221	2045	28500
Massachusetts.........	101	13	114	8.1	89	2850	
New Hampshire.........	64	7	71	5.3	12	1805	
New Jersey............	105	20	125	8.5	121	4461	
New York..............	1676	172	1848	98	101	13450	
Ohio..................	758	1442	2200	693	2838	13511	
Pennsylvania..........	1257	506	1763	160	674	19285	8409
Vermont...............	333	18	351	6.2	6	765	
Virginia..............	397	1092	1489	176	817	6670	10723
West Virginia.........	89	381	470	155	76	1721	2643
Sub-Total	5898	6126	12024	1441.8	6764.5	85492	83558

[1]From USDA, SRS Publication Lv Gn 1(71). As of 1/1/71 except for hogs and pigs which is of 12/1/70.

[2]Proportion based on Tabulation for 1/1/70.

[3]From USDA, SRS Publication Pou 2-7(71) 8/52 of total year production (to reflect average broilers on hand at one time).

[4]Total for 22 Primary States which produce 97% of Nation's broilers.

[5]Excludes turkeys which are included in "other states" at end of table.

Livestock and Poultry Inventory - 1971
50 States

Region and States	Cattle[1] Dairy[2]	Beef[2]	Total[1]	Sheep[1] and Lambs	Hogs[1] and Pigs	Chickens[1] and Turkeys	Broilers[2]
	----------	----------	----------	1000 head	----------	----------	----------
SOUTH REGION							
Alabama................	237	1736	1973	5.9	1110	19301	57759
Arkansas...............	153	1634	1787	8	392	24131	69645
Florida................	257	1607	1864	5.6	374	17099[5]	7184
Georgia................	271	1731	2002	5.5	2065	40279	69327
Louisiana..............	286	1419	1705	23	259	4853	7747
Mississippi............	372	2165	2537	16	632	15331	38149
North Carolina.........	318	763	1081	16	2031	23423	47290
Oklahoma...............	263	4822	5085	122	506	3545	
South Carolina.........	111	550	661	1.5	633	8228	4216
Tennessee..............	517	1837	2354	35	1111	7387	7607
Texas..................	583	11995	12578	3789	1419	19014	28317
Sub-Total	3368	30259	33627	4027.5	10532	182591	337241

[1]From USDA, SRS Publication Lv Gn 1(71). As of 1/1/71 except for hogs and pigs which is of 12/1/70.

[2]Proportion based on Tabulation for 1/1/70.

[3]From USDA, SRS Publication Pou 2-7(71) 8/52 of total year production (to reflect average broilers on hand at one time).

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Livestock and Poultry Inventory - 1971
50 States

Region and States	Cattle[1] Dairy[2]	Beef[2]	Total[1]	Sheep[1] and Lambs	Hogs[1] and Pigs	Chickens[1] and Turkeys	Broilers[3]
	------	------	------	1000 head	------	------	------
MIDWEST REGION							
Illinois	554	2691	3245	317	7468	11000	
Indiana	414	1523	1937	251	5129	18544	2049
Iowa	901	6502	7403	797	16322	16917	
Kansas	332	6286	6618	328	2202	4673	
Michigan	817	710	1527	251	819	8268	
Minnesota	1715	2283	3998	504	3692	13584[5]	
Missouri	636	4353	4989	272	5120	9558	3781
Nebraska	309	6148	6457	370	3691	6397	
North Dakota	236	1954	2190	368	425	1313	
South Dakota	296	4202	4498	1121	2009	5708	
Wisconsin	3236	922	4158	151	1932	8204[5]	
Sub-Total	9446	37574	47020	4730	48809	104166	5830

[1]From USDA, SRS Publication Lv Gn 1(71). As of 1/1/71 except for hogs and pigs which is of 12/1/70.

[2]Proportion based on Tabulation for January 1, 1970.

[3]From USDA, SRS Publication Pou 2-7(71) 8/52 of total year production (to reflect average broilers on hand at one time).

[4]Total for 22 Primary States which produce 97% of Nation's broilers.

[5]Excludes turkeys which are included in "other states" at end of table.

Livestock and Poultry Inventory - 1971
50 States

Region and States	Cattle[1] Dairy[2]	Beef[2]	Total[1]	Sheep[1] and Lambs	Hogs[1] and Pigs	Chickens[1] and Turkeys	Broilers[3]
	1000 head						
WEST REGION							
Alaska	3	6	9	27	1.1	26	
Arizona	77	1212	1289	506	79	1373[5]	
California	1269	3502	4771	1264	165	56092	13370
Colorado	200	3316	3516	1229	352	2135	
Hawaii	24	225	249	---	58	1370	
Idaho	288	1447	1735	773	171	1139[5]	
Montana	72	3032	3104	1142	221	1400[5]	
Nevada	27	630	657	206	13	23	
New Mexico	55	1317	1372	799	60	1340[5]	
Oregon	201	1408	1609	479	122	3497	2333
Utah	137	703	840	1058	59	1880	
Washington	301	984	1285	144	96	6390	3170
Wyoming	28	1433	1461	1734	38	197[5]	
Sub-Total	2682	19215	21897	9361	1435.1	76862	18873
							445502[4]
TOTAL - 50 STATES	21394	93174	114568	19560.3	67540.6	449111	459280
						Other States Turkeys 1135	
						450246	

[1]From USDA, SRS Publication Lv Gn 1(71). As of 1/1/71 except for hogs and pigs which is of 12/1/70.
[2]Proportion based on Tabulation for January 1, 1970.
[3]From USDA, SRS Publication Pou 2-7(71) 8/52 of total year production (to reflect average broilers on hand at one time).
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Bibliography

1. Amounts, Compositions, and Management of Feedlot Runoff, Technical Report No. 12, Texas Ag. Exper. Station, Texas A&M University, December, 1972

2. Animal Wastes, Minnesota Pollution Control Agency 1971, St. Paul, Minnesota

3. Animal Waste Management, Proceedings of National Symposium on Animal Waste Management EPA, The Airlie House, Warrenton, Virginia September 1971, Council of State Governments, 1735 De Sales St. N.W. Washington, D.C. 20030

4. Beef and Swine Waste Handling System, Dale H. Vanderholm, Regional Extension Project, Iowa State University, 1972

5. Beef Cattle Feedlot Site Selection for Enviornmental Protection, EPA-R2-72-129 November, 1972

6. Cattle Feedlot Runoff - Its Nature and Variation, J. R. Miner, R. I. Lipper, L. R. Fina, and J. W. Funk, Paper, Kansas Water Pollution Control Association, Topeka, Kansas, 1966

7. Characteristics of Rainfall Runoff from a Beef Cattle Feedlot, EPA-R2-72-061 September, 1972

8. Characteristics of Wastes From Southwestern Cattle Feedlots, USEPA, Project 13040 DEM, Water Pollution Control Research Series, Washington, D.C. (by Texas Tech University Water Resources Center, Lubbock, Texas) January, 1971

9. Chavez County Agricultural Pollution Survey, Chavez County, New Mexico, USDA Soil Conservation Service, for the Macho-Roswell, Hagerman Dexter Soil and Water Conservation District, April 1972

10. Closed System Waste Management for Livestock, U.S. Environmental Protection Agency, Project 13040 DKP, Water Pollution Control Research Series, Washington D.C., 1971 (by Agricultural Pollution Control Laboratory, Dept. of Ag. Engineering, Michigan State University, East Lansing, Michigan

11. Dairy Waste Storage Ponds for Soil-Plant Recycling, Agricultural Sanitation and Waste Management Series, University of California, Davis, November, 1972

12. The Economic Value of Liquid Manure, Delta Mosquito Abatement District, 1737 W. Houston Avenue, Visalia, California, 1960

13. Effects of Cattle Feedlot Manure on Crop Yields and Soil Conditions, Technical Report No. 11, Texas Ag. Exper. Station, Texas A&M University, December, 1972

14. Evaluation of Beef Cattle Feedlot Waste Management Alternatives, A. F. Butchbaker, J. E. Garton, G. W. A. Mahoney, M. D. Paine, Oklahoma Agricultural Experiment Station, Oklahoma State University, Stillwater, Oklahoma, Water Pollution Control Research Series, November, 1971, Grant 13040 FXG

15. A Hill of Soil That Destroys Manure, California Farmer, May 5, 1973

16. How to Control Feedlot Pollution, Bulletin F, California Beef Cattle Feeders Association, 3040 19th Street, Bakersfield, California 93301 June, 1973

17. Individual Stall Housing For Dairy Cattle, University of California, Agricultural Extension Service July, 1967

18. Livestock Waste Management and Pollution Abatement, The Proceedings of the International Symposium on Livestock Wastes - American Society of Agricultural Engineers, St. Joseph, Michigan 49085, April 1971

19. Management of Nutrients on Agricultural Land for Improved Water Quality, U.S. EPA, Project No. 13020 DPB, Department of Agronomy, College of Agriculture and Life Sciences, Cornell University, Ithaca, New York, August, 1971

20. Manure Waste Ponding and Field Application Rates, Part I (Study Findings and Recommendation) Part II Technical Report; J. L. Meyer, University of California, Agricultural Extension Service, Davis, March, 1973

21. Materials Related to Coulthard Waste Conversion System, Unpublished. Copies available at Tulare County Planning Department, Courthouse, Visalia, California

22. Minnesota State Regulations for the Control of Wastes From Livestock Feedlots, Poultry Lots, and Other Animal Lots, Minnesota Pollution Control Agency, St. Paul, Minnesota, April, 1971

23. Nitrates in the Upper Santa Ana Basin in Relation to Groundwater Pollution, Robert S. Ayers, Roy L. Branston, unpublished manuscript for Kearney Foundation of Soil Science, University of California, July, 1971

24. Pollution Control - Feedlot Operations, J. R. Miner, E. R. Baumann, T. L. Willrich, and T. E. Hazen, Paper, 42nd Annual Conference, Water Pollution Control Federation, Dallas, Texas, October, 1969

25. Pollution Implications of Animal Wastes, Research Program, Robert S. Kerr, Water Research Center, Ada, Oklahoma, U.S. Dept. of the Interior, Federal Water Pollution Control Administration, July 1968 (by Dr. Raymond C. Loehr, Water Resources and Agricultural Engineering, Cornell University, Ithaca, New York)

26. Pollution Potential of the Confined Livestock Feeding Industry, Mid West Research Institute, EPA Contract No. 68-01-0025, June, 1971

27. Proposed Confined Animal Feeding Environmental Control Act, State of California, Department of Food and Agriculture, Draft, March, 1973

28. A Progress Report on Manure Waste Ponding, University of California, Agricultural Extension Service, J. L. Meyer and Dwight Baier, Davis, California, December, 1971

29. Role of Animal Wastes in Agricultural Land Runoff, U.S. EPA Grant 13020 DGX, Water Pollution Control Research Series, Washington, D.C. 1971, (by Department of Biological and Agricultural Engineering, School of Agriculture and Life Sciences North Carolina State University at Raleigh)

30. Rules and Regulations Confined Feeding Operations, Water Quality Commission, Department of Environmental Quality, State of Iowa, January, 1973

31. Special Farm Supplement, Tulare Advance Register, February, 1973

Environmental Impact Report

ENVIRONMENTAL IMPACT REPORT

DESCRIPTION OF PROJECT:

The project is the introduction of new dairies into Tulare County. According to Article 6, Section 15068 of the Guidelines for Implementation of the California Environmental Quality Act of 1970, the responsible agency may employ a single environmental impact report to describe more than one project, if such projects are essentially the same in terms of environmental impact. With the application for the issuance of a Special Use Permit a cover sheet will be attached to subsequent dairy impact reports describing the precise location and particular objectives sought by the applicant. The project is to be accomplished under the specific conditions set forth in the Tulare County Planning Commission Special Use Permits. Such use permits are also reviewed at a public hearing and approved or disapproved by the Board of Supervisors of Tulare County. Section 16 of the Ordinance Code specifies that dairies are allowed in the A-E, A-E 20, A-E 80, and A-1 Zones with a use permit. No permit is required if there are to be less than 25 animals on the property.

DESCRIPTION OF ENVIRONMENTAL SETTING:

The regional setting of proposed dairies is usually rural. Dairies act as an indirect buffer against urban expansion. In most incidents, new dairies must be situated outside windshed areas, so other rural uses act as a buffer between dairies and urban uses. The Tulare County Health Department requires that there be a minimum of a 10 foot separation between the sump and water-bearing strata. Another requirement is that sumps not exceed a 20 foot depth. The type of soil will influence the particular employment of animal waste disposal systems and this will be reviewed with each application.

Applicable Plans, Policies and Goals

Below are the requirements that must be met by the proposed dairy in Tulare County for approval:

Criteria to be Met Prior to Staff Level Approval of Dairy Use Permits:

1. Minimum gross lot size, ½ of ¼ Section (80 acres). (Includes all easements and right-of-ways taken or used from this property for public or utility purposes.)

2. Closest proximity of constructed buildings of the dairy to other dairy buildings* on adjoining lands or to the buildings associated with swine raising or feed lot operations -- 660'.

3. The new dairy structures shall not lie within a windshed area as defined on the open space map of the Environmental Resources Management Element of Tulare County.

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*Excluding feed and hay storage, parking, garages, or dwellings of dairy workers or family of owner.

4. The new dairy should not have its main structures less than the distance shown on the accompanying Micro Windshed diagram (attached Diagram A) to an occupied dwelling owned by a property owner other than the dairy owner.

Conditions to be Attached to all Staff Level Dairy Use Permits:

1. The facility shall be developed and maintained in accordance with the plans and specifications submitted with the application and the standards contained herein.

2. Sufficient parking area shall be provided for all cars and trucks, and the parking area, work area and entrance road shall be treated with road oil or other acceptable dust retarding treatment so that dust and mud will not create conditions detrimental to the surrounding area and roads.

3. Dedication to the County of Tulare of all property lying within _____ feet of the centerline of the right-of-way of Avenue _____ (Road _____), necessary to bring all adjacent road right-of-ways up to current County standard.

4. The proposed use shall meet the criteria of the "California State Water Resources Control Board Minimum Guidelines for Protection of Water Quality from Animal Wastes"

5. The proposed use shall meet the standards of Water Resources Bulletin #74 for domestic and irrigation water supplies.

6. A fire truck pumper outlet shall be installed in a location specified by the County Fire Warden and be as a minimum a 4' x 2½" Wharf hydrant with National Standard threads.

7. The proposed sump pit(s) shall be large enough to hold 120 days accumulation of waste water.

8. The proposed sump pits shall comply with all standards and requirements set forth by the encompassing Mosquito Abatement District for a use of this type.

9. The dairy waste pond shall be restricted to a depth to maintain at least a 10' separation between the bottom of the pond and the top of any water-bearing strata.

10. The applicant shall demonstrate that liquid and solid waste materials will be handled in such a manner as to prevent a nuisance caused by fly breeding, dust or odors. Dust, odor and flies shall be kept to a minimum and shall not be allowed to become a nuisance to the adjoining properties.

11. No portion of the property covered by this application shall be sold or used for purposes other than those expressly permitted under this Use Permit unless an amendment to the Use Permit is approved by the County. This shall not restrict the sale of the entire parcel of property as a unit.

and aerobic environments wherein bacteria act upon waste materials to reduce them to usable materials. Over a period of several months, a fine clay-like substance is deposited on the bottom of the sump, sealing it from the surrounding soils, while water and fluidized effluent materials are distributed onto large adjoining tracts of land. In the first several months nitrate and salt penetration into soil could be a problem and cause excess concentrations. These concentrations would decline after sealing of the pond has become effective. Selected grasses and plants, especially corn silage, are often grown on this land in order to utilize the nutrients contained in this irrigating wastewater. Thus, most of the waste material generated by the dairy operation are recycled to available green food for these and other animals. Other operations may utilize direct application of manure upon surrounding crop lands. In both instances, careful attention must be paid to amounts of liquids and/or manure applied per acre of land so as to avoid build-up of salts and nitrogen in soils and groundwater which may be harmful.

Careful design and the concrete paving of certain concentration areas, as well as the enclosure of certain areas of the dairy system, mitigate the generation of dust from these modern operations.

ALTERNATIVES TO THE PROPOSED ACTION:

A return to older methods of dairy operation such as bringing the dairy cows in from large grazing acreages for milking each day is not possible in terms of today's agricultural economy. One alternative that is being explored includes the even greater intensification of animal numbers and even closer proximity of these dairy facilities, one to the other, in order to economically facilitate the possibility of a full scale collection and sewage processing system, and a totally enclosed operation to prevent any airborn effluent. It appears that this latter alternative is not economically feasible at this time, although constant investigations are being made into the possibility of these and other alternatives.

Of course, the alternative of no project at all must be mentioned. The dairy operations are important to the total human environment in terms of efficient production of valuable foods. Another alternative is limitation of numbers of animals per operation, as well as dispersal of operations with buffering distances by other land uses.

The prevention or elimination of such facilities would apparently lead to severe economic losses in the local agricultural economy and most obviously, a curtailment of the production of a basic human foodstuff.

THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY:

Among the cumulative and long-term effects of the proposed project which may adversely affect the local environment, the production of dairy waste materials, which may cause some downwind odor problems in the vicinity of the dairy, nevertheless may have the effect of upgrading the soil type and consequently the floral productivity of the currently low productivity soils where manure is directly applied in quantities which are not excessive for the capability of the particular soil to absorb. The consistent addition of nutrients and organic materials to the surrounding soils may, over a period of time, increase the utility of this soil for other agricultural purposes and may also increase the relative productivity of the soil. Conversely, excessive additions of solid or liquid animal wastes applied to the soil may cause excessive and deleterious nitrogen and salt build-up in soils and ground and surface waters.

A long-term effect of the dairies will be to continue to discourage the development of urban and suburban residential developments nearby due to the potential for odor problems in this agricultural hinterland. In that respect the long-term effect would be beneficial in encouraging the further development of existing vacant areas in partially urbanized areas of the County in terms of the Spheres of Influence and Urban Area Boundaries and Growth policies embodied in the General Plan of Tulare County.

It appears that the cumulative effect of several similar projects in the same area could be detrimental to each other, however, the conditional requirements of the permits issued by the Planning Commission and Board of Supervisors in these proceedings rely heavily upon distance and other mitigating factors to minimize any potential for a cumulative effect among similar, as well as divergent, land uses in such circumstances. Specific locational criteria which may be applied at the Building Permit state are being investigated by the Staff and Commission at this time.

IRREVERSIBLE ENVIRONMENTAL CHANGES WHICH WOULD BE INVOLVED IN THE PROPOSED ACTION SHOULD IT BE IMPLEMENTED:

It appears that no nonrenewable resource would be used by the introduction of a new dairy on this land. Ample evidence is available to indicate that a dairy can be replaced at a future time by other land uses, for example, the former dairying areas of the Los Angeles Basin from which many of the new installations in this County are coming. One environmental change which has been mentioned before is the gradual upgrading or degrading of the soil classification. However for all practical purposes, the upgrading of the soil classification due to the addition of organic and nutrient materials may be essentially irreversible. There are also possible groundwater and soil pollution hazards due to these organic and nutrient materials.

THE GROWTH INDUCING IMPACT OF THE PROPOSED ACTION:

The principal growth inducing aspect of these dairy operations is essentially to preclude the development of land nearby for residential subdivision or other dense urban uses. Thus the introduction of the dairies in this area would tend to keep the area in agricultural use on surrounding lands, in direct conformance with the existing General Plan for the County.

WATER QUALITY ASPECTS:

Prior to the operation of the dairy the applicant must apply to the Water Quality Control Board so discharge requirements may be determined and receive certification indicating that the site complies with the appropriate regulations to protect water quality and waste disposal. There must also be approval by the Tulare County Health Department.

COORDINATION:

This Environmental Impact Report was prepared by the Planning Department of Tulare County in conformance with the directives of the Tulare County Board of Supervisors.

FINAL STATEMENT:

Members of the Agricultural Advisory Committee have remarked upon the potential environmental problems associated with new dairies. In general their comments indicate that the careful design, construction and maintenance of the facilities, and particularly the waste collection and treatment facilities minimize the environmental impacts associated with the dairy. Further, they have indicated that when such facilities are appropriately designed, constructed, and operated, these facilities in appropriate locations of the agricultural hinterland will not cause any significant environmental impact upon the environment due to the specific design and operation coupled with the remote location.

The general attitude concerning the introduction of new dairies is that with appropriate care in design, construction and operation, coupled with appropriate site location, such dairies can be safely constructed without significant negative environmental impact while producing a critically important human foodstuff.

(Further statements will be added upon the completion of this report.)

Respectfully submitted,

ENVIRONMENTAL REVIEW COMMITTEE
Robert L. Wall, Secretary

Rita C. Bee

Rita C. Bee, Planner

RCB:mn

Approved by ______________
ENVIRONMENTAL REVIEW COMMITTEE

Sept 24, 1973
Date

40 Days
Review Period

Approved by ______________
ENVIRONMENTAL REVIEW COMMITTEE

10-29-73
Date

10 Days
Final Review Period

OFFICE MEMORANDUM TULARE COUNTY DEPARTMENT OF PUBLIC HEALTH

TO Robert L. Wall, Planning Director DATE: May 10, 1973

FROM A. R. Maniscalco, R.S.

SUBJECT Proposed Criteria for Approval of Dairy Permits in Tulare County, April 18, 1973 Draft (Corrected Copy)

I have had the opportunity to review the April 18, 1973 draft of the criteria and find that items that have been eliminated should be put back in:

1. "The dairy waste pond shall be restricted in depth to maintain at least a 10' separation between the bottom of the pond and any water bearing strata. The dairy waste pond shall not be more than 20' deep."

The Health Department feels that any lesser distance as recommended by studies in Northern California to be inconclusive. The studies had shown that it took approximately 3 months for a pond to seal. Where was the effluent going in that interim period? What was happening to the water bearing stratas? A reasonable margin of safety should be considered and 10' is not too large a margin.

2. "The proposed sump pits shall be large enough to hold 120 days accumulation of waste water."

There are two reasons to include this requirement to make sure that the ponds are large enough:

a. During the winter there is a period of time when the land is wet and no irrigation and no pre-irrigation is taking place.

b. The Water Quality Control Board guidelines require that the pond be large enough to retain run-off from a 10 year, 24 hour storm.

3. "The applicant shall demonstrate that liquid and solid waste materials will be handled in such a manner as to prevent a nuisance caused by any fly breeding, dust or odors. Dust, odor and flies shall be kept to a minimum and shall not be allowed to become a nuisance to the adjoining properties."

This item is clear that the dairyman should not produce a public nuisance.

4. "No portion of the property covered by this application shall be sold or used for purposes other than those expressly permitted under this use permit unless an amendment to the use permit is approved by the County. This shall not restrict the role of the entire parcel of property as a unit."

As evidenced in recent Planning Commission hearings, there can be conflicting agricultural uses. This section protects the neighboring agricultural activities within a given area.

ARM:dmp

12. All exterior lighting shall be so adjusted as to deflect direct rays away from public roadways and adjacent property.

13. The proposed facilities shall be constructed, maintained and operated in accordance with all State and County Health regulations, and County zoning and building laws.

14. Any structure built shall conform to the building regulations and the building line setbacks of the Ordinance Code of Tulare County insofar as said regulations and setbacks are applicable to such structure.

15. The conditions set down shall be complied with commensurately or before the premises shall be used for the purposes applied for, in order that the safety and general welfare of the persons using said premises, and the traveling public, shall be protected.

16. The Use Permit shall automatically become null and void one year after the date on which it is granted, unless the applicant, or his successor, has actually commenced the use authorized by the permit within said one-year period. The permit may be renewed.

17. The Use Permit will not be effective until the applicant, at his own expense, has executed and filed with the County Recorder on a certified copy of this permit with a duly authorized acceptance, in a form approved by the County Counsel, endorsed thereon.

ENVIRONMENTAL IMPACT:

As with the Description of Project and the Description of the Environmental Setting, individualized statements will be added in this section when there are unique circumstances for this type of operation and the locale.

ADVERSE ENVIRONMENTAL AFFECTS WHICH CANNOT BE AVOIDED IF THE PROPOSAL IS IMPLEMENTED:

Downwind odors and occasional dust could be a problem that cannot be avoided in the operation of dairies such as these without the use of prohibitively expensive systems. The relatively remote location of these facilities, and certain criteria for spacing and locational factors applied by the Planning Commission and Board of Supervisors in their normal proceedings for the issuance of a Special Use Permit, should reduce the problem of dust and odor to acceptable levels at the site of these projects.

Potential problems of nitrate and salt level increase in local groundwaters is not yet fully substantiated. Specific wastewater treatment facilities including careful collection of wastewaters and materials from the dairy and the anaerobic/aerobic activities of carefully designed wastewater treatment ponds combined with specific agricultural practices including selective cropping, should reduce this potential problem to a manageable level.

MITIGATION MEASURES PROPOSED TO MINIMIZE THE IMPACT:

Precise engineered plans will be filed with the Planning Department indicating that a wastewater collection and treatment system acceptable to the United States Soil Conservation Service for purposes of Federal assistance to such operations will be incorporated here. Wastes and wastewater from all areas of animal concentration are conveyed to one or more sumps. These sumps contain levels of anaerobic

ERME PREPARED BY TULARE COUNTY PLANNING DEPARTMENT